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Terminal Evaluation Report: Terminal Evaluation of “Catalyzing the Use of Solar Photovoltaic Energy” Project

Evaluator: Mohammad Alatoom

2020

UNDP Atlas ID. 00079907. Project ID: 00089774. PIMS #: 5137 GEF ID 5063

Evaluation time frame and date of evaluation report

Country: Iraq GEF Operational Program/Strategic Program: GEF-5 Objective # 3 (Climate Change Mitigation CCM-3):
“Promote Investment in Renewable Energy Technologies”

Implementing Partner and other project partners: directly implemented (DIM) by UNDP in close cooperation with the Ministry of Environment

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Project at glance

The project targets residential-scale units (a few kilowatts) as well as utility-scale units (several megawatts). The project aims to facilitate the installation of 5 MW in aggregate of residential-scale PV generation capacity through the Bytti residential development in Najaf, Iraq. The project also aims to support the Iraqi Ministry of Electricity in the establishment of large, utility-scale PV plants, primarily by providing technical and investment support. The project supports the development of a regulatory framework, technical guidelines, capacity building, and institutional arrangements for the development of public and private (Independent Power Producer, IPP) solar power plants.

The project's National Focal Point is the Ministry of Environment. The project will receive close collaboration from the Ministry of Electricity, the Renewable Energy Research Centre of the Ministry of Science and Technology, and others. The project is expected to last 48 months.

Project objective

The project was designed to reduce greenhouse gas emissions in Iraq by demonstrating and catalyzing the application of solar power to meet the energy needs of offices, small businesses, residences and town services through small-scale distributed solar PV installations and utility-scale plants, on- and off-grid

Acknowledgements

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Disclaimer

This report is the work of an independent consultant and does not necessarily represent the views, or policy, or intentions of the Iraq Government or UNDP.

Executive summary

Project description

Project Title:	Catalysing the Use of Solar Photovoltaic Energy in Iraq			
GEF Project ID:	5063		<u>at endorsement (Million US\$)</u>	<u>at completion (Million US\$)</u>
UNDP Project ID:	00089774	GEF financing:	US\$ 2,227,273	\$2,214,082.07
Country:	Iraq	IA/EA own:	US\$ 215,200	250,000
Region:	Arab region	Government:	US\$ 22,750,000	24,000,000
Focal Area:	GEF-5 Objective # 3 (Climate Change Mitigation)	Other:	US\$ 10,000,000	10,000,000
FA Objectives, (OP/SP):	CCM-3): "Promote Investment in Renewable Energy Technologies"	Total co-financing:	US\$ 32,965,200	34,250,000
Executing Agency:	UNDP	Total Project Cost:	US\$ 35,192,473	36,477,273
Other Partners involved:	Iraqi Ministry of Electricity and Ministry of Health & Environment	ProDoc Signature (date project began):		Dec 15, 2014
		(Operational) Closing Date:	Proposed: Dec 30, 2018	Actual: Dec 31, 2019

- The project was designed to reduce greenhouse gas emissions in Iraq by demonstrating and catalysing the application of solar power to meet the energy needs of offices, small businesses, residences and town services through small-scale distributed solar PV installations and utility-scale plants, on- and off-grid. The three key expected outcome results are:
 - Outcome 1: Investment in solar photovoltaic power technologies for on-grid and off-grid connection.
 - Outcome 2: Encouragement of investments in solar power technology in Iraq and consumer uptake of solar appliances through policy reform and financial incentives.
 - Outcome 3: Facilitation of private-sector capacity for technology development innovation and servicing in the solar industry through capacity building and

domestic market analysis electricity generation for office, residential, small business and town application.

Evaluation Rating Table

Table 1 Evaluation rating table

Evaluation ratings			
1. Monitoring and Evaluation	Rating	2. IA & EA Execution	Rating
Overall Quality of Monitoring & Evaluation	Satisfactory	Quality of UNDP implementation – Implementing Agency (IA)	Satisfactory
M&E design at project at entry	Satisfactory	Quality of Execution - Executing Agency (EA)	Satisfactory
M&E Plan Implementation	Satisfactory	Overall quality of Implementation / Execution	Satisfactory
3. Assessment of Outcomes	Rating	4. Sustainability	Rating
Relevance	Relevant	Financial resources	Likely
Effectiveness	Satisfactory	Socio-political	Likely
Efficiency	Satisfactory	Institutional framework and governance	Likely
Overall Project Output Rating	Satisfactory	Environmental	Likely
		Overall likelihood of sustainability	Likely

Conclusions

- The Iraq solar PV project has been successful and has achieved its outcomes and objective. It has produced a number of instrumental outputs and had a significant and positive impact, which is likely to continue long after the project closes. The project has contributed towards establishment to solar PV capacity of 10.9 MW at the distribution level. The GHG emission reductions due to these solar PV facilities over the lifetime of 20 years would be 195,553.41 tons CO₂ including 10,836.89 CO₂ until the time of terminal evaluation. At the utility scale level, the project made substantial contribution to the pipeline projects (currently going through the bidding process) 755 MW, this would result in additional CO₂ reductions over 20 years starting from 2022 (operation is expected to commence in 2022). The project overall lifetime consequential GHG emissions avoided (bottom-up) estimated at 13,560,142 ton CO₂. See tables 13 & 14 for detail numbers.
- During the project lifetime, Iraq has been going through difficult political and security situation including protracted wars against terrorism, and these circumstances have influenced project delivery, for example slowing down the approval of new renewable energy law as it was hard to compete on other national security issues on the government and parliament agendas. This needed to take exceptional adaptive management measures that were effectively taken during project implementation to avoid further delays or disruptions in project implementation by providing robust evidence about the ineffectiveness of the Feed in Tariff mechanism, and suggesting reasonable alternatives using the net metering. The adaptive actions on part of the project team to take on board RCREEE as an implementation partner and to establish rooftop solar PV at 6 houses at the Baytti Complex has greatly helped the project.

4. The project has effectively addressed the key barriers towards a larger sustainable uptake of solar PV in the country, and to reducing the dependence of Iraq on fossil fuels for its energy needs. The project has been instrumental in the establishment of a utility scale grid-connected solar PV power generation facility in Iraq, which will act as a demonstration facility and would lead to replications.
5. The PV market in Iraq has clearly taken off due to the project implementation. The successful impact of the project is evident through:
 - The project has provided 6 pilot solar PV rooftop installations at Baytti complex aggregating a total capacity of 30 KW, the project demonstration activities of the 6 pilots resulted in further adoption of the selected inverter technology, for example the new PV systems in the Ministry of Higher Education and Scientific Research as well as Ministry of Electricity have used the same inverter technology.
 - GHG Emission Reduction has been achieved and expected to exponentially grow
 - The project has produced enablers technical reports and guidelines that are properly documented by PMU and largely used and referred to by stakeholders. For example, the project developed Iraq PV Grid Connection Code which was officially adopted by the Iraqi Government. Also, the recently developed Renewable Energy Law that is seeing its way to parliament at the time of the TE.
 - The project conducted capacity building activities for the Iraqi officials to support and establish a transparent and attractive process for IPP engagement. A series of exposure visits of the key decision makers in Iraq was organised as part of South-South Cooperation to Morocco, Egypt and Jordan. In addition to that, workshops and events were held locally within the country and abroad targeting technical staff from various ministries, private sector, academic institutes and NGO's. The participants gained knowledge on how to bridge the gaps of the current PPA process.
 - The general public is much more conscious now of the need to reduce GHG emission
 - Private sector is more capable to invest in PV sector under tendering process. The private sector is now more engaged through a systematic approach in delivery utility-scale PV investment through the tendering process.
6. The project design was relevant and reasonable to the national development priorities and the Long-Term Energy Strategy of Iraq and continues to be of relevance to the current national development strategy. The Project Document is concise and includes the required level of details. It addresses barriers and opportunities for larger uptake of grid connected solar PV in its different components and responds to the national requirements through an appropriate list of outcomes and outputs, though indicators could have been SMARTer. Gender issues were considered wherever practical on the project design and delivery. This included in delivering gender sensitive PV policies and legislations where equal opportunities for PV investment are given to both Iraqi men and women. Similarly, training opportunities and broader engagement strategy considered gender balanced approach.

7. The project implemented effective stakeholders' engagement strategy during project development and implementation, this has been a contributing factor to successful achievement of the project objectives. Despite being a DIM project, the project management has been engaging relevant stakeholders quite extensively. It has been obvious during the TE, and especially during the interviews, that stakeholders have been engaged constructively and this led to establish a case of ownership, it is noted that many interviewees were calling the project as "our project".
8. The project has successfully identified and established effective regional partnerships with valuable sources of best practices in Jordan, Egypt, Tunisia, Morocco as well as regional organisations like RCREEE. It was obvious during the TE that these partnerships were influential in terms of knowledge transfer and capacity building.
9. The Project Management Unit (PMU) appears to have become a trusted source for the partners. This has come strongly during TE interviews with stakeholders that the PMU has been, and still in some cases, a trusted reference point when it comes to PV in Iraq. The PMU team members have been acknowledged by partners as technically-sound, trusted and engaging partners.
10. The sustainability of the project impacts are likely to continue beyond the project timeframe. The project has been successful in creating investment in solar PV by providing the policy and legal framework along with incentives to roll out the PV development in the country. This is now evident through the 755 MW tendering process and the overall momentum of the Iraqi government in adopting the renewable energy law and in further advancing the PV agenda in the country.

Recommendations

11. **Recommendation #1:** Design SMARTer indicators for future projects. Although indicators, targets and deadlines were defined in the logframe, several lacked a clear means for tracking progress and impact outside the project with definitive sources of validation in the market, such as external indicators and targets with which to track the real market uptake of PV technologies as discussed in section 3.1.1 of this report. SMARTer indicators need to be designed to capture the full Theory of Change principles so that all indicators and targets are clearly defined at the short term output, medium term outcome and long term impact levels and suitable and realistic means of verification are chosen and detailed. This would help the project to guide its strategic directions, and collect meaningful data that helps to achieve insightful monitoring and evaluation of project activities.
12. **Recommendation #2:** UNDP to pursue engagement with the MoE for full completion of round 2 of the utility-scale PV tendering process to continue providing advice and best practice.
13. **Recommendation #3:** To maintain the uptake momentum of solar PV installations, it is recommended that Government of Iraq maintains all present fiscal incentives at least for the next 10 years to enable achieving long term targets.
14. **Recommendation #4:** The performance data from solar PV installations at both distributional and utility-scale levels would be of great value for analysing and planning future market

development. It is recommended that data on actual PV generation and electricity use be cross-validated with the solar maps to be generated, to guide plans for future solar PV programmes.

15. **Recommendation #5:** Having the PV sector taken off in Iraq, it is time to shift thinking towards create an enabled environment for private sector PV investment in Iraq, therefore, it is recommended that UNDP shares with the Government of Iraq (MoE in particular) information about UNDP-invented "Derisking Renewable Energy Investment (DREI) methodology. DREI methodology can help Iraq analyse existing derisking instruments, identify what needs to be improved or added, explore the most effective options and implement the most effective package of public policy actions¹.
16. **Recommendation #6:** Establish a project library and disseminate final knowledge products to all stakeholders. The project has produced enamours technical reports that are properly documented by PMU, but need to be properly disseminated to all stakeholders as a final set of all project outputs. This could be easily done through a CD or a memory stick that include all information in one final source of truth and then distributed to all stakeholders. One of the options which could be explored is creation of a dedicated web-site either hosted by MoST or the University of Baghdad (this will ensure sustainability of this knowledge dissemination platform beyond the implementation of GEF project).
17. **Recommendation #7:** The project identified significant networking opportunities in the MENA region, notably the RCREEE partnership has been effective from the Government of Iraq perspective, it is therefore recommended that Government of Iraq maintain strategic regional partnerships with available sources of best practices and UNDP continue to facilitate south-south cooperation in the RE sector.
18. **Recommendation #8:** Acknowledging that GEF guidelines suggest conducting terminal evaluations within six months before or after completion of a full-sized project. It is recommended that TE evaluation takes place during the period of 6 months prior end date of the project, where a bigger room for responsive corrective actions are more likely to be implemented.

Acronyms

Table 2 Acronyms and abbreviations

Acronym	Definition	Acronym	Definition
CO	UNDP Country Office	O&M	Operation & Maintenance
CPD	Country Programme Document	PIR	Project Implementation Review
CO2	Carbon Dioxide	PMAC	Prime Ministers Advisory Committee
CSP	Concentrating Solar Power	PMU	Project Management Unit
DREEE	The Department of Renewable energy and energy Efficiency	PPG	Project Preparation Grant
EE	Energy Efficiency	PPP	Purchasing Power Parity

¹ Derisking Renewable Energy Investment (UNDP, 2013)



EENS	Expected Energy Not Supplied	PSC	Project Steering Committee
EMP	Electricity Master Plan	PV	Photovoltaic
GDP	Gross Domestic Product	QPR	Quarterly Progress Report
GEF	Global Environment Facility	RCU	UNDP Regional Coordination Unit
GHG	Green House Gas	RCREEE	Regional Centre of Renewable Energy and Energy Efficiency
IEA	International Energy Agency	RE	Renewable Energy
IPP	Independent Power Producer	REEC	Renewable Energy and Environment Centre (under Moe)
KPI	Key Performance Indicator	RTA	Regional Technical Advisor
M&E	Monitoring and Evaluation	SWH	Solar water heater
MoE	Ministry of Electricity	TE	Terminal Evaluation
Men	Ministry of Environment	TPR	Tripartite Review
Most	Ministry of Science and Technology	TTR	Terminal Tripartite Review
MRV	Monitoring, Reporting and Verification	Twh	Terawatt-hour (one thousand billion watt-hours)
MTR	Mid Term Review	WB	World Bank
MW	Megawatt	UNDAF	United Nations Development Assistance Framework
M&E	Monitoring & Evaluation	UNDP	United Nations Development Programme
NAMA	Nationally Appropriate Mitigation Action	UNEP	United Nations Environment Programme
NES	National Energy Strategy	UNFCCC	United Nations Framework Convention on Climate Change
NGO	Non-Governmental Organisation		

1. Introduction

1.1 Purpose of the evaluation

19. In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP support GEF financed projects are required to undergo a terminal evaluation upon completion of implementation. This report concerns the Terminal Evaluation (TE) of the project, Catalyzing the Use of Solar Photovoltaic Energy in Iraq (PIMS 5137) to assess project results achieved since December 2014.
20. The evaluation process is intended to promote accountability and transparency, assess whether the project has achieved its objectives, synthesize lessons to help guide future design and implementation of GEF funded UNDP activities, and contribute to the overall assessment of results in achieving GEF strategic objectives aimed at global environmental benefits.
21. Evaluation is an integral part of the UNDP project cycle². Its purpose is to provide a comprehensive and systematic account of the performance of the project by assessing its design, process of implementation, achievements (outputs, outcomes, impacts and their sustainability) against project objectives endorsed by the UNDP and government (including any agreed changes in the objectives during project implementation) and any other results.
22. The Evaluation is undertaken with the aim of gaining a deep understanding of project development impact. This will involve assessing project progress toward its stated objectives as well as contribution to relevant Country Programme Document (CPD) outcome.

1.2 Scope and methodology

23. The main objective of the terminal evaluation (TE) is to assess whether the project has achieved or is likely to achieve the project objectives. The evaluation assesses the project performance against the five evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.
24. The objectives of the evaluation are also to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.
25. The evaluation assesses the extent to which the project is achieving impacts or progressing towards the achievement of impacts. Key findings that should be brought out in the evaluations include whether the project has contributed to, or enabled progress toward, reduced environmental stress and/or improved ecological status.
26. The TE is also expected to draw lessons and develop recommendations that may help in improving the selection, enhancing the design and implementation of similar future projects and activities in the country, improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

² UNDP Programme and Operations Policies and Procedures (POPPs)

27. **Evidence-based evaluation:** Evidence is essential element of the project evaluations, the evaluation involves collection and generation of evidence to support the evaluation process by engaging relevant partners in refining the theory of change in each programmatic element, identifying causal relationships, testing assumptions, assessing specific indicators and data collection methods, processing and utilizing procedures, and defining a learning and research agenda.
28. The Terminal Evaluation was undertaken in a participatory manner in which the key stakeholders were consulted throughout the evaluation process. The evaluation was guided by the key evaluation criteria based on the "Guidance for Conducting Terminal Evaluations of UNDP-supported GEF-financed Projects"³.
29. The evaluation was undertaken in line with UNDP principles concerning independence, credibility, utility, impartiality, transparency, disclosure, ethical, participation, competencies and capacities⁴. The consultants have signed the Evaluation Consultant Code of Conduct, thereby agreeing to abide by the UNEG Code of Conduct⁵. The evaluation was carried out by an independent, international Consultant.
30. The evaluation process is independent of UNDP, the Iraq Government, and project partners. The opinions and recommendations in the evaluation will be those of the Evaluator and do not necessarily reflect the position of UNDP, or any of the project stakeholders. Once accepted, the evaluation becomes a recognised and publicly accessible component of the project's documentation.
31. The evaluation was carried out between late December 2019-February 2020 (analysis and reporting). Interviews and meetings with implementing partners, experts, beneficiaries and other key stakeholders took place in February.
32. Evaluation is an evidence-based assessment of a project's concept and design, its implementation and its outputs, outcomes and impacts as documented in the project document. Evidence will be gathered by reviewing documents, interviewing key, selected stakeholders and from other ad hoc observations.
33. The standard evaluation criteria according to UNDP evaluation policy are **Relevance, Impact, Effectiveness, Efficiency and Sustainability**. It is acknowledged the ToR defined the domain of the review under 5 domains, and here are how these domains relate to the evaluation criteria:

Evaluation Criteria	Domain
Appropriateness (relevance and design)	i. Project design/strategy
	ii. Relevance to national priorities
	iii. Alignment with UNDP strategic plan
Effectiveness	iv. Progress Towards Results Progress Towards Outcomes Analysis

³ Evaluation Office, 2012, Guidance for Conducting Terminal Evaluations Of UNDP-Supported, GEF-Financed Projects

⁴ Guidance for Conducting Terminal Evaluations of UNDP-supported, UNDP Evaluation Office, 2012.

⁵ UNEG Code of Conduct in the UN System (2008).

Efficiency	v.	Program Implementation and Adaptive Management Arrangements
Sustainability	vi. vii.	Durability of the results Likelihood that outputs and outcomes will continue after the program cycle
Process	viii. ix. x.	Project Governance Stakeholders engagement Delivery mechanisms

- **Relevance** concerns whether the results, purpose and overall objectives of the intervention are in line with the needs and aspirations of the beneficiaries, and with the policy environment of the intervention, within the context of this program, mainly how research topics, objectives and activities are relevant to build operational and technical national research and institutional capacities to meet the objectives of the GE conventions;
- **Impact** is the effect of the program on its wider environment, and its contribution to the wider sector objectives summarized in the program's Overall Objective, and on the achievement of the overarching policy objectives of the national institutions, GE conventions and the various partners involved. Impact includes positive and negative, primary and secondary effects produced by a development intervention on its beneficiaries, directly or indirectly, intended or unintended;
- **Effectiveness** is the contribution made by the program's results/outcomes to the achievement of the program purpose. Effectiveness describes how well the results achieved have furthered the attainment of the intervention purpose both in quality and in quantity. It includes also catalytic and synergistic effects among program components, as well as political, institutional, natural, social economic/financial, cultural factors which supported or impeded program implementation;
- **Efficiency** is used to assess if the results were obtained at reasonable cost, i.e. how well means and activities were converted into results, and the quality of the results achieved. It describes the relationship between the produced outputs and the utilized resources.
- **Process** is to assess the effectiveness of program governance, stakeholders engagement, delivery mechanisms and decision making processes adopted by the program;
- **Sustainability** is the likelihood of a continuation in the stream of benefits produced by the program after the period of external support has ended. Key factors that impact on the likelihood of sustainability include: (i) ownership by beneficiaries; (ii) policy support/consistency; (iii) appropriate technology; (iv) environment; (v) socio-cultural issues; (vi) gender equity; (vii) institutional management capacity; and (viii) economic and financial viability.

34. The different scales for rating various criteria are shown in table 3 below, and further defined in table 4 (level of satisfaction scale) and Table 5 (likelihood of sustainability scale). Sustainability concerns the extent to which environmental, social and economic benefits are likely to continue from a particular project.

Table 3 Ratings and their scales for different evaluation criteria

Outcomes, Effectiveness, Efficiency, M&E, I&E Execution	Sustainability	Relevance
6. Highly Satisfactory (HS): no shortcomings 5. Satisfactory (S): minor shortcomings 4. Moderately Satisfactory (MS): moderate shortcomings 3. Moderately Unsatisfactory (MU): significant shortcomings 2. Unsatisfactory (U): major shortcomings 1. Highly Unsatisfactory (HU): severe shortcomings	4. Likely (L): negligible risks to sustainability 3. Moderately Likely (ML): moderate risks 2. Moderately Unlikely (MU): significant risks 1. Unlikely (U): severe risks	2. Relevant (R) 1. Not relevant (NR)
	Additional ratings if relevant	Impact
	Not Applicable (N/A)	3. Significant (S)
	Unable to Assess (U/A)	2. Minimal (M)
		1. Negligible (N)

35. The project objective and outputs will be rated according to their respective outputs, based on evidence provided by project teams and assessed by the Evaluator, and by means of performance indicators using the 6-point satisfaction scale (Table 4). Other aspects of performance, such as effectiveness, efficiency, relevance and sustainability, will be assessed using the full set of ratings shown in Table 3 and 5.

Table 4 Definitions of ratings of levels of satisfaction

Rating	Definition
Highly Satisfactory (HS)	The project had no shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.
Satisfactory (S)	The project had minor shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.
Moderately Satisfactory (MS)	The project had moderate shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.
Moderately Unsatisfactory (MU)	The project had significant shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.
Unsatisfactory (U)	The project had major shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.

Highly Unsatisfactory (U)	The project had severe shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.
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Table 5 Definitions of levels of risk to sustainability of Project outcomes

Rating	Definition
Likely (L)	Negligible risks to sustainability, with key outcomes expected to continue into the foreseeable future.
Moderately Likely (ML)	Moderate risks , but expectations that at least some outcomes will be sustained.
Moderately Unlikely (MU)	Substantial risk that key outcomes will not carry on after project closure, although some outputs and activities should carry on.
Unlikely (U)	Severe risk that project outcomes as well as key outputs will not be sustained.

1.1 Key Evaluation Questions

36. Key evaluation questions are developed and categorized under evaluation domains, as follows:

Table 6 Key Evaluation Questions

Key evaluation questions
Appropriateness
- <i>How does the project relate to the needs of the beneficiaries, and relevant strategic plan?</i> - <i>How well the program is designed?</i>
Effectiveness
- <i>To what extent are the expected activities of the project being achieved?</i> - <i>How is the project effective in achieving its expected outputs/outcomes?</i>
Process
- <i>How effective the project governance, stakeholders engagement, delivery mechanisms and decision making processes adopted by the program?</i>
Efficiency
- <i>How efficiently have the project resources been turned into results?</i>
Sustainability
- <i>What are the probabilities that the project achievements will continue in the long run?</i>

1.2 Data collection and analysis

37. The project evaluation used a mixed method to collect data, which includes the following: desk reviews of key documents (such as: annual report and strategic review), project data, and other relevant research, reference materials, interviews, and meetings with relevant stakeholders.
38. Data and information were collected via various methods, including semi-structured interviews covering participants in development project, project members, as well as data review and analysis of monitoring and other data sources and methods. Information were analysed and consulted with project, and then an evaluation report draft will be developed. Triangulation of data in this evaluation was done through discussing multi-perspective when investigating the project effectiveness, data was triangulated to increase the level of knowledge about the project and to strengthen the evaluation findings on standpoint from various aspects, and to facilitate validation of data through cross verification from different data sources.

1.3 Structure of the evaluation report

39. The structure of this Terminal Evaluation Report corresponds to the Evaluation Report Outline as documented within the TOR for the assignment. See annex 1: ToR.
40. This Terminal Evaluation is based on a performance assessment approach guided by the principles of results-based management. The evaluation tracks impact per the project's Logical Framework. The contribution of project outputs and project management is evaluated with reference to the achievement of the project outcomes and overall objective.
41. This Terminal Evaluation reviews the implementation experience and achievement of the project results against the Project Document endorsed by the GEF CEO, including any changes made during implementation.

2. Project description and development context

2.1 Project start and duration

42. UNDP CO and RCO together with the Government of Iraq finalized the Project Document in November 2014 through Project Preparatory Process funded by the Global Environmental Facility (PIF was approved in November 2012). In December 2014, the UNDP-supported GEF-financed project was signed between the Government of Iraq and UNDP Iraq. This was followed by immediate inception workshop on January 19-20, 2015, Project team organized the Inception Workshop held in Amman Jordan to review objectives, expected outcomes and outputs, update current status of the solar PV and outline work plan 2015.
43. The project has gone through a Mid-Term Review (MTR) in July 2018. The project was due to complete in December 2018; however, the project was granted a no-cost extension to end of December 2019. This TE evaluation took place between December 2019 and February 2020).

2.2 Problems that the project sought to address

44. Iraq's energy sector is its most significant economic sector—with the oil subsector accounting for over 65 percent of gross domestic product (GDP), more than 90 percent of annual government revenue, and 98 percent of the country's exports. Iraq has the fifth largest proven crude oil reserve in the world, with 141.4 billion barrels, and the oil and gas sector dominates the economy, even by regional standards. With the rapid increase in production since 2015, the country is now the world's third largest and OPEC's second largest oil exporter.
45. Despite vast oil and gas reserves, Iraqis do not have access to adequate electricity for basic needs and must resort to using expensive diesel generators. Inadequate infrastructure to gather, process, and transport natural gas have led to massive gas flaring at over 60 percent of the total gas produced. Due to the inability to utilize the flared gas, Iraq relies on expensive and imported alternative fuel supply sources costing an estimated US\$6 billion to US\$8 billion per year, with the cost of power shortages exceeding US\$40 billion annually⁶.
46. Iraq's challenged electricity sector faces a demand growth of over 10 percent per annum. There are chronic electricity shortages, with grid supply availability at less than 15 hours per day⁷. Iraq's citizens are exasperated with continued poor reliability of the electricity supply, which hampers growth and well-being. **Over the period to 2030, electricity demand is set to double, reaching about 150 terawatt hours (TWh) (17.5 gigawatts [GW] average throughout the year)**⁸.
47. About 80% of Iraqis are connected to the electricity grid, however, a large number of households (about 90%) rely on some sort of diesel power generation partly due to power outages / load shedding (due to demand exceeding the supply) and partly because electricity grid is not available in their area. Lack of electricity during the critical summer months affects national productivity and makes it difficult to work in the stifling heat.
48. These independent operators erect ad-hoc distribution grids. There are an estimated 55,000 to 80,000 private diesel generators in Iraq, supplying an estimated 21 TWh, or 30% of the total electricity generated. The operators are often licensed by the local provincial council, but are otherwise poorly regulated. They contribute to chronic air and noise pollution problems, at great local health cost, but provide much-needed electricity. As a result, primarily of private diesel generators, air pollution in Iraqi cities is well above World Health Organization and local guidelines. These pollutants have adverse effects on human respiratory, neurological and immune systems. In addition, as they settle or as they are spread by wind and rain they cause acidification and pollution of water and soil.
49. The project intends to address the problem of shortage of electricity, increasing high pollution levels and increasing GHG emissions by Catalyzing the use of solar PV in Iraq. With electricity shortages, significant unused land area, abundant solar resources, a large summer day-time peak load corresponding to the use of air-conditioning, and considerable losses in

⁶ Iraq Prime Minister Advisory Commission (IPMAC), INES. Baghdad: IPMAC, 2013.

⁷ World bank, 2019.

⁸ IEA (2019), Iraq Energy Outlook.

transmission and distribution solar power is considered as ideally suited for Iraq. The modular nature of solar energy (subject to availability of space solar power systems can be deployed from a few watts to several hundreds of megawatts), and the opportunity to develop distributed generation systems with minimal dependencies on existing infrastructure and institutional processes while having significant potential to feed back into the electricity grid during peak load periods, make solar a compelling electricity source in Iraq.

50. Some of the problems towards adoption of solar power in Iraq includes the following;

- **Government subsidies suppress public electricity prices to artificially low levels.** As a result, consumer electricity prices are rather low, ranging from 0.8 US cents/kWh for consumption up to 1,000 kWh/month, to 4 US cents/kWh for consumption over 4,000 kWh/month. Often, consumers do not pay any bills at all; after protests, Iraqis are formally exempt from payment for the first 1,000 kWh per month of usage.
- Although, compared with this diesel-based electricity price, solar power generation may be competitive, there **are issue with the large initial cost of solar PV.**
- Apart from price competitiveness, there are other barriers towards widespread use of solar PV in Iraq. Some of these barriers includes **lack of infrastructure and legislative framework to promote solar power, and lack of technical capacity.**

51. The GEF project is designed to address each of these barriers to catalyse the development of solar power in Iraq. Table below provides a summary of the barriers and the corresponding strategies provided in the project design to overcome the barriers.

Table 7 Summary of barriers and mitigation strategies

Barrier	Situation at the time of project design
Institutional	• Insufficient human resource capacity to perform effectively
Regulatory	• Absence of consolidated set of regulations governing on-grid PV. • Absence of transparent procedures for selection of projects.
Lack of successful demonstration	• In the past some initial ventures into solar power use were made (solar PV street light, solar PV based water purification systems, solar PV pumps). These past efforts have not been successful due to a variety of reasons (including failure of the batteries due to extreme external temperatures). • The past failures has created a negative view in the mind of the stakeholders, regarding suitability of solar PV systems in Iraq (due to conditions like extreme temperatures, dust etc.)
Financial	• Absence of feed-in tariffs for solar PV • Non-existence of financial incentives and risk-mitigation instruments. • Lack of financial support in terms of feed-in tariffs for large-scale systems to catalyse growth.

Technology	• Lack of sufficient knowledge of latest developments in on-grid PV system design and construction. • Absence of guidelines and technical standards for on-grid PV. • Scarcity of experienced PV system designers, installers and maintenance personnel.
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2.3 Immediate and development objectives of the project

52. The objective of the project was to **reduce greenhouse gas emissions in Iraq** by demonstrating and catalysing the application of solar power to meet the energy needs of offices, small businesses, residences and town services through small-scale distributed solar PV installations and utility-scale plants, on- and off-grid.
53. The GEF project was meant to advance the work done so far in Iraq with regard to solar power technologies and related baseline initiatives. It was intended to facilitate the most practical and affordable range of solar power options that can meet the operational conditions in Iraq and address the most critical electricity demands.
54. The proposed project will advance the baseline project in four critical areas:
- By designing, piloting and monitoring selected solar photovoltaic technologies for distributed generation applications. In the case of Government-funded activities (e.g. the design assessment work led by the Ministry of Science and Technology), the project incrementality arises from the GEF's catalytic role in initiating and accelerating plans that have been 'on paper' for some time.
 - By supporting a first wave of utility-scale plants, to be developed by MoE, as demonstration plants to be later emulated by IPPs. By developing the initial wave of utility-scale plants, MoE will bear much of the initial risk, therefore reducing this risk for later IPPs through dissemination of monitoring data and experience gained in implementation.
 - By stimulating investments in solar power technology and increasing consumer uptake of such technologies through new policies, tools and financial incentives.
 - By facilitating private sector capacity for solar technology development and servicing, through awareness-raising, training and dissemination sessions on the IPP concept.
55. These four elements are expected to work in synergy, organizing and enhancing the baseline project so as to promote global environmental benefits (enhanced climate change mitigation) and making the transition from loosely-connected concepts and exploratory solar power technical and institutional initiatives to coherent and targeted investments, which in turn will encourage uptake and replication that will ultimately anchor solar power as a fundamental element of the integrated national energy strategy in Iraq⁹.

⁹ Integrated National Energy Strategy (INES), Iraq Prime Minister Advisory Commission, 2012.

2.4 Baseline Indicators established

56. In accordance with the GEF's Focal Area Objective #3 to "Promote Investment in Renewable Energy Technologies" of the GEF-5 Climate Change Strategy, the key success indicators of the project are:

- Extent to which policies and regulations for decentralized RE are adopted and enforced;
- Volume of investment mobilized; and
- Tonnes of CO₂-equivalent avoided.

57. Specifically, the project document suggested the flowing targets:

- Installation of 5 MW of distributed rooftop PV in the Baytti development in Najaf (Changed in MTR)
- Installation of 16 utility-scale solar PV plants (Changed in MTR to be 4 plants)
- Establishment of Government policies, regulations and financial incentives to promote investment in solar energy
- Completion of technical and regulatory standards needed for connection of private power generators to the grid
- Development of a solar resource map for Iraq
- Development of a feed-in tariff, packaged as a NAMA
- Development of human capacity in Government, the private sector and academia to support a solar energy market in Iraq

58. Some of these indicators were either modified, deleted or new ones added in the MTR. See section 3.1.1 for details.

2.5 Main stakeholders

59. A principal benefit of the GEF project will lie in strengthening the institutional framework and inter institutional cooperation on renewable energy, and specifically solar energy. The project engaged with various stakeholders in different capacities and roles. Below table provides the list of the main stakeholders of the project long with their respective roles.

Table 8 stakeholders of the project

Stakeholder	Role and Responsibility
Ministry of Electricity (Moe)	The Ministry of Electricity (MoE) is the main body responsible for electricity supply in Iraq. Within Moe, there are two recently established entities: The Department of Renewable energy and energy Efficiency (DREEE) and the Regulatory Office. Both institutions form part of the institutional apparatus of the draft Electricity Law. Both institutions are currently small. DREEE is tasked with the promotion of renewable energies, including supporting initiatives such as feed-in tariffs, net-metering, tax exemptions, etc. The Regulatory

	Office is tasked with developing the regulatory framework required for the evolution of the power sector in Iraq, both renewable and conventional. This includes, for example, preparing regulations for private power generation, grid access, licensing, power purchase agreements and the format for price determination (whether public tender, fixed price, etc.). As part of the project document, MoE was directly involved in the development of 16 solar power plants, with the aggregate capacity of 36.5 MW, with total co-finance of \$200 million. These plants, through operational monitoring, were to form the basis for lessons-learned and capacity development to be applied to future plants. However, with the change in the strategy of the government, wherein all the new capacity (both for renewable and for fossil fuel based) is now being promoted in the private sector, this role of MoE has undergone change. MoE is now actively pursuing creation of grid connected utility scale solar PV facilities in the private sector.
Ministry of Health and Environment (MoHEnv) & Former Ministry of Environment (MoEn)	The Ministry of Environment (MoEnv) is the principal Government body concerned with greenhouse gas mitigation and the reduction of other pollutants. It is the Focal Point for UNFCCC. The Ministry has identified renewable energy as the focus for mitigation efforts. The Ministry is the Focal Point for this project and is responsible for collecting the monitoring data from the various project pilots and packaging that information for public dissemination. The Ministry is involved in public awareness campaigns regarding the benefits of solar power. The Ministry is also to help with discussions and coordination for the required policy and regulatory reforms to spur the development and growth of the solar power in Iraq. The Ministry of Environment is also leading the Nationally Appropriate Mitigation Action (NAMA) elements of the project. It is worth noting that during the age of the project MOEnv has been merged with the Ministry of Health which is called now the Ministry of Health and Environment (MoHEN).
Ministry of Science and Technology (MoST)	The Ministry of Science and Technology (MoST) is engaged in a number of initiatives involving solar energy. In the context of this project, MoST is to be involved in the technology selection process and will therefore have the opportunity to contribute some of the experience it has acquired to date as well as further develop its capacity and that of other stakeholders. MoST was to support MoE for site selection and basic planning for three sites of the 16 that Moe intended to use for solar power development. Now with Moe no more taking up development of the utility scale solar PV, this part of the project is no more being taken up by MoST. Since 2006, MoST has been actively examining solar energy applications that suit Iraqi conditions (for example, experimentation with solar-tracking PV panels, and with various solar-powered applications). MoST has also examined a range of rooftop units to be used to generate power for

	household consumption, and also to feed to the grid. MoST is the Iraq's focal point for the International Renewable Energy Agency, IRENA. Because of its previous work, MoST is one of the entities best positioned to advise on the practicalities of operating solar equipment in the heat and dust of Iraq. Recently, MoST has been merged with the Ministry of Higher Education and Scientific Research (MoHESR).
Renewable Energy Research Centre (RERC)	Anbar University's Renewable Energy Research Centre (RERC) was one of the most active academic centers in the field of renewable energy in Iraq. There is a history of cooperation between RERC and MoST on various research projects. Anbar University's RERC was established as part of a cooperation project with UNDP in which the University provided space, facilities and personnel to support the Research Centre, and UNDP provided technical assistance and equipment (solar and wind testing equipment to date, as well as reference materials). The principal focus of effort at present is the development of a solar radiation atlas for Iraq, in cooperation with MoST. Under the project RERC was to be provided technical assistance for solar mapping. It will also have a role in the capacity building component of the project to encourage replication throughout Iraq. Unfortunately, RERC was significantly impacted by the political conflicts and wars. The project managed to establish strong ties with national academic institutions active in renewable energy fields. These include the Department of Energy Engineering under the umbrella of the College of Engineering, Baghdad University, College of Energy and Environment, Alkarkh University, College of Technical Engineering, the Middle Technical University, The Technical Institute-Baghdad under the umbrella of Middle Technical University and others. Due to ongoing security issues in the country, RERC could not participate in the project very actively. Due to this reason the task of development of solar atlas was offloaded to RCREEE. The task of development of a curriculum and introducing a technical course on solar PV in an educational institute has been shifted to the University of Baghdad.
Regional Centre for Renewable Energy and Energy Efficiency (RCREEE)	Regional Centre for Renewable Energy and Energy Efficiency (RCREEE) is an intergovernmental organization with diplomatic status that aims to enable and increase the adoption of renewable energy and energy efficiency practices in the Arab region. Iraq is one of the member countries of RCREEE. RCREEE is working in a partnership organisation with UNDP for carrying out a number of tasks under the project.
University of Baghdad	The University of Baghdad has been roped in as one of the partner organisation for implementation of the project. The university will be

	responsible to development of curricula for a technical course on solar PV and introducing the course in the University.
Al Shafei / other private sector parties	Al Shafei is a private-sector conglomerate that is developing the Baytti Complex, a 1,300 home community that was to incorporate 5 MW of distributed (small-scale, roof-top), grid-connected PV solar power. Now with the significant delay in completion of the the construction at Baytti Complex and an on going issue regarding who is to bear the cost of solar PV, there is a lot of uncertainty regarding implementation of 5 MW of solar rooftop PV AT Baytti Complex. The project is now engaging with a couple of other private sector parties (solar PV equipment suppliers) to facilitate establishment of solar roof top systems for the house hold and small businesses.
Others	There are a number of other small stakeholders involved in the development of solar projects – mainly off-grid – in Iraq. Al Mansour Company, wholly owned by the Ministry of Industry and Minerals (Mol&MS), is the largest assembler of solar PV modules and components in Iraq. It has also begun to invest in manufacturing capacity for several balance-of-plant (BoP) components, such as the steel frames on which the PV panels are installed. During the age of the project, Al Mansour Company merged with Al Zawra State Company under the umbrella of Mol&MS. Other Iraqi firms working in the field include Iraq Global Technologies, a supplier of solar power systems for on-grid and off-grid applications, and Faidh Al Wafa General Trading.

2.6 Expected Results

60. According to the project document, the direct CO₂ emission reductions attributed to the GEF project are estimated to be 741,622 tCO₂ from the 41.5 MW installed PV power systems, resulting in a GEF cost of \$3/tonne CO₂ avoided. This is a conservative estimate of the project's mitigation impact as it considers only the 41.5 MW installed as a direct result of the GEF project and using GEF funds or co-finance. These numbers were reviewed during the MTR, the MTR suggested to change the target to 160,000 tons of CO₂ (down from 741,622 tons of CO₂) as a subsequent change to recommendation #1 of the MTR to change the target for installation and operation of utility-scale PV plants to 4 (down from 16 in the project document).
61. The associated national and local benefits include reduced local pollution from the burning of fossil fuels and increased national revenue through the availability of unburnt fossil fuel for export.
62. These developments will catalyze the adoption of renewable energy technology and provide a foundation that allows the widespread use of renewable energy either in response



to regulatory stimulus or simply to help realize systems where renewable energy may already be advantageous but are not utilized due to a lack of capacity or awareness.

63. Outcomes, outputs and indicators are further explained in section 3.1.1.

3. Findings

3.1 Project Design and relevance

3.1.1 Analysis of Results Framework (Project logic, strategy; Indicators)

64. The log-Frame presented the indicators against the project objective at the aggregate level, for each of the three Outcomes of the project. The evaluators analysed the intended project outcomes by using the "SMART" (Specific, Measurable, Achievable, Relevant, Timebound) approach and found them reasonable and appropriate. As an instrument for planning activities under the implementation framework defined in the Project Document, the logframe was adequate for reporting to GEF and for project management and reporting to UNDP.
65. The logframe adequately facilitated the tracking of implementation targets for each year of project implementation and was thereby suited for the operational evaluation of project progress. Although indicators, targets and deadlines were defined in the logframe, several lacked a clear means for tracking progress and impact outside the project with definitive sources of validation in the market, such as external indicators and targets with which to track the real market uptake of PV technologies; numbers of applications for installations, for example, from Government spending on RE programmes would have provided reliable indications of project progress with a clear link to the project's objective.
66. **There were several weaknesses in the project's logframe** that have been outlined in MTR. The MTR suggested amendments on the project indicators. The TE notes that the project's log-frame is relatively conventional, or safe, **and CO2 targets (direct and indirect) were far too ambitious and didn't take into account the timeframe needed to reach a stage of operations for utility-scale PV developments.**
67. **Indicators defined under outcome 2 and 3 were output-driven** such as "Development of model contracts for power purchase agreements", this indicator is limited to output and **doesn't give any insights on the outcome (impact)**, in this case would be number of PV project using the PPAs or government adopting the PPA provided by the project.
68. **In some cases, the indicator statement, baseline and targets don't correspond to each other's**, for example the first indicator under outcome 3 is "Availability of individuals and organisations capable of supporting activity in the Iraqi solar market", and the target reads as "Solar power market demand/industry response strategy developed for Iraq, informed by case studies from other countries with developed solar power industries, domestic market analysis, and clarification of Iraqi private sector opportunities for distributed solar PV power production. Iraq private sector and Government agencies exposed to all aspects of the industry (technology development, supply, servicing, financing)". The target statement is lengthy and contains multiple milestones where none of them actually correlates to the intent of the indicator i.e increase in the availability of a capable private sector players.

Table 9 SMART assessment of project indicators

Indicator	End-of-Project Target	TE SMART Analysis				
		S	M	A	R	T

Objective level indicators					
Amount of reduced CO2 emissions by the investments facilitated by the project. Baseline: 0	Target A: Installations in place and operating to achieve direct reduction of 741,622 tonnes CO2 over a 20-year lifetime from project start ¹⁰ . (target changed to 160,000 tco2 during MTR)	✓	✓	x	x
	Target B: Indirect: Mechanisms in place to support the further expansion of PV installations to result in indirect emissions reductions of 5.9 million tonnes CO2.	✓	✓	x	✓
Outcome 1					
Volume of investments mobilized Baseline: 0	Target 1: Installation and operation of 5 MW of distributed, grid-connected PV. at Bytii. "at Baytti" was removed.	✓	✓	x	x
	Target 2: Installation and operation of 16 utility-scale PV plants (changed to 4 during MTR)	✓	✓	✓	✓
	Target 3: Monitoring and recording operational data from all the pilot solar PV installations to inform the development of future PV plants	x	✓	✓	✓
Outcome 2					
Extent to which RE policies and regulations are adopted and enforced Baseline: There have been early-stage discussions between MoE and UNDP on net-metering. There have been no concrete steps or commitments.	Target 4: Development and implementation of a grid code for distribution and transmission (for small-scale distributed generation and larger utility-scale generation).	✓	✓	✓	✓
	Target 5: Design and implementation of a process for IPPs to engage in standardized PPAs with the Ministry of Electricity, to acquire generation licences and to inter-connect with the grid.	✓	✓	✓	✓
	Target 6: Development of model contracts for power purchase agreements.	✓	✓	✓	✓
	Target 7:	✓	x	✓	✓

¹⁰ The project document assumes: 1. Iraq Emission Factor is 0.51257, 2. 41.5 MW installed as a direct result of the GEF Project, 3. 20-year lifespan for PV equipment, and 4. a capacity factor of 20%.

	Implementation of phased fiscal incentives for PV uptake, including partial removal of import taxes on solar panels.					
	Target 8: Design of a feed-in tariff for renewable energy IPPs with appropriate pricing calibration, geographical zoning and regression schedule, and packaged as a NAMA.	✓	✓	✓	✗	✓
	Target 9: Evaluation of net-metering options for industrial and residential applications.	✗	✓	✓	✓	✓
	Target 10: Evaluation of a range of policies for specific circumstances, such as tenders for large solar installations (suitable for Iraq's environment).	✗	✓	✓	✓	✓
	Target 11: Support to implementation of the feed-in tariff and/or net-metering scheme.	✗	✗	✓	✓	✓
	Target 12 ¹¹ : Renewable energy database (solar map) containing site-specific data on RE potential to facilitate investment decisions	✓	✓	✓	✓	✓
	Target 13 ¹² : Development of the feed-in tariff as a policy NAMA, with corresponding baseline, MRV and institutional systems.	✓	✓	✓	✓	✓
Outcome 3						
Availability of individuals and organisations capable of supporting activity in the Iraqi solar market. Baseline: No effective capacity building exists for the industry. There are few industry players Availability of market data to track development of solar PV in Iraq.	Target 14: Solar power market demand/industry response strategy developed for Iraq, informed by case studies from other countries with developed solar power industries, domestic market analysis, and clarification of Iraqi private sector opportunities for distributed solar PV power production. Iraq private sector and Government agencies exposed to all aspects	✗	✗	✓	✓	✓

¹¹ A new target added by MTR

¹² A new target added by MTR

Baseline: No significant market data exist.	of the industry (technology development, supply, servicing, financing).					
	Target 15 Development and delivery of certified technical training on solar PV technologies (hybridization, supply, service) for emerging private sector companies	✓	✓	✓	✓	✓
	Target 16 Development and delivery of dissemination sessions on future IPP involvement in the electricity supply network, including relationships with technology firms and Government agencies, feed-in tariffs, and net-metering options.	x	✓	✓	✓	✓
SMART: Specific, Measurable, Achievable, Relevant, Time-Bound Green: SMART criteria complaint; Yellow: questionably compliant with SMART criteria; Red: not compliant with SMART criteria						

3.1.2 Barriers, assumptions and Risks

Barriers

69. The strategy of the project was centred on removing the barriers leading to larger uptake of solar PV, and provided for five different components with each component targeting a specific set of barriers.
70. **The project has effectively addressed each of these barriers towards a larger sustainable uptake of solar PV in the country**, and to reducing the dependence of Iraq on fossil fuels for its energy needs. Below table outlines key responses taken by the project to address the barriers.

Table 10 Project responses to identified barriers

Barrier	Situation at the time of project design	Project responses to identified barriers
Institutional	Insufficient human resource capacity to perform effectively	Formulate and implement capacity strengthening programme to address specific gaps in the capacity
Regulatory	- Absence of consolidated set of regulations governing on-grid PV. - Absence of transparent procedures for selection of projects.	- The project drafted new RE law in Iraq. The law has progressed into an advanced stage for final endorsement by the parliament. - The project developed a compendium of regulations related to on-grid PV development. - The project advised the MoE on best practices and required transparent procedures for selection of projects.

Lack of successful demonstration	• In the past some initial ventures into solar power use were made (solar PV street light, solar PV based water purification systems, solar PV pumps). These past efforts have not been successful due to a variety of reasons (including failure of the batteries due to extreme external temperatures). • The past failures has created a negative view in the mind of the stakeholders, regarding suitability of solar PV systems in Iraq (due to conditions like extreme temperatures, dust etc.)	• The project has provided 6 pilot solar PV rooftop installations at Baytti complex aggregating a total capacity of 30 KW • These six grid-connected solar installations in Baytti are fully functional and are connected to the internet for performance (power generation) data storage and online access for all related partners • Interviews with stakeholders indicated positive views towards expanding RE in general and PV in particular.
Financial	• Absence of feed-in tariffs for solar PV • Non-existence of financial incentives and risk-mitigation instruments. • Lack of financial support in terms of feed-in tariffs for large-scale systems to catalyse growth.	• The project provided technically sound advice to the MoE that FIT is not the best option in case of Iraq, and alternatively the net metering option is the most feasible for Iraq. (see 3.1.1) • The project developed set of financial incentives and risk-mitigation instruments, and the Iraqi government adopted these measures – see section 3.1.1 for list of incentives adopted. • Development of a sustainable financial mechanism (NAMA) for FITs. • The project built the capacity of the Ministry of Health and Environment (MoHEnv) to promote climate mitigation and preparation for climate financing. The project facilitated the necessary training on NAMA and ensured wider discussions on the NAMA priorities. • The project developed a draft NAMA Roadmap involving the key stakeholders, experts, academia and civil society organization. The road map defined the institutional arrangements and NAMA readiness sectorial programme, as well as NAMA design elements and outline template
Technology	• Lack of sufficient knowledge of latest developments in on-grid PV system design and construction. • Absence of guidelines and technical standards for on-grid PV. • Scarcity of experienced PV system designers, installers and maintenance personnel.	• The project supported the evaluation of crystalline (mono and poly) and thin-film technology PV modules, and calculation of the most suitable performance ratios for each for small PV systems based on technical data and field measurements • The project invested substantially in building the capacities and building knowledge related to PV system design and construction with involvement of private sector. • The project formulated guidelines and technical standards for on-grid PV system (grid code) and installations.

Assumptions

71. **The project document doesn't cover the project assumption at the same level of details as it does for risks and barriers.** Assumptions¹³ are critically important in testing the project theory of change through regular monitoring and evaluation activities.
72. Nonetheless, the project strategy provided an overview of the route towards the intended result of larger uptake of solar PV. **The underlying assumption that the removal of barriers will lead to higher uptake of solar PV has proven to be correct** when seen in the present-day context – evidently the 755 MW PV developments that are currently in bidding process are leading the way for bright PV future in Iraq.
73. Other key assumptions were implicit in the identified risks and barriers, such as that the private sector is interested and ready to participate in the project. Which the project has responded to via capacity building and regulatory frameworks development.

Risks

74. At the design stage, a thorough risk analysis was carried out and appropriate risk mitigation strategies were worked out. Annex 8.1 of the project document gives an overview of risks identified at the time of project design. The risks outlined were logical and robust and addressed during the day to day management of the project.

Table 11 Terminal Evaluation perspective on key project risks

Risk	Type	Impact & probability ¹⁴	End of Project Perspective
The security situation in Iraq is unstable. Without general security, the ability of crews to travel, transport goods and work will be restricted. With renewable energy equipment, where the entire capital is procured and installed upfront, theft or damage can mean a complete loss of invested capital	Political/ Operational	May prevent access to certain areas for implementation of projects P = 3 I = 4	During the project period, Iraq has been going through instable political conditions including wars against terrorism and many instabilities. This risk limited the mobility of the project crews, however the project dealt within the security umbrella established by the UN Mission in Iraq. The project organized UN security convoys for field visits to Najaf and other field sites (Al Mansour) by the International experts. The important technical events and workshops including the Steering Committee meetings were organized in the Green Zone, a secure area in Baghdad. The project has been part of criticality analysis conducted by the CO with the purpose to determine security risks and to ensure safeguard mechanisms for its implementation in Iraq. This has led to the decision of having the solar technician stationed at Najaf so as to reduce

¹³ A project Assumption is "A factor in theory of change (logeframe) that is considered to be true, real or certain often without any proof or demonstration

¹⁴ Probability from 1 (low) to 5 (high). Impact from 1 (low) to 5 (high)

			movement for organising capacity building event. In addition to the operational limitations, the security issues played a critical role in getting the momentum for solar energy in the country, for instance, the Council of Ministers needed to prioritize the security issues over endorsing PV regulations and new law.
The Government may fail to marshal the necessary resources or coordination amongst its entities to bring about the desired legislative and regulatory reform	Regulatory	Lack of policy basis to catalyse adoption of solar power P = 2 I = 5	The project has managed to establish coordination with the higher authorities (Prime Minister's Advisory Council)' which has created avenues for necessary legislative and regulatory reforms to be pursued by the project in partnership with RCREEE. The project was able to bring the regulatory reform into the agenda of the PMAC. Currently the new RE law has been approved by the council of ministers, and due to be sent to parliament.
Novelty and adoption risk – Private-sector entities in Iraq are slow to adopt new technology and take-up unfamiliar business models, in part because the overall 'ecosystem' of security, regulatory clarity, financing, technical capacity and awareness, does not encourage this	Organizational	Slow uptake of solar by market participants P = 2 I = 4	The project invested substantially in building the capacities and building knowledge related to PV system design and construction with involvement of private sector. The project engaged the private sector in the national consultations on the regulatory framework and RE law.
Financial Risks – The Government and private financial systems in Iraq are slow to adopt incentives to promote industries. This reflects, in part, the slow pace of policy reform and decision-making in Iraq. The cost of importing and installing units in Iraq will mean PV prices will be higher than on the international market, while alternatives (diesel and electricity) are heavily subsidised. Therefore, the long-term success of the PV market	Financial	Lack of financial incentives and heavy fossil fuel subsidies will mean limited incentive for the widespread use of solar power. P = 3 I = 4	The private sector in Iraq has been the hardest hit during the project as the economy of the country has gone down significantly. This has adversely impacted the project outcome since the construction of the Beitty residential complex has been slowed down considerably. Consequently, replication potentials of the pilot installations at Beitty has suffered. Further, the project has started to observe increased investment through private sector involvement (under PPAs) which is expected to surpass investment level originally estimated.

will depend on adoption of financial incentives by the Government.			
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3.1.3 Stakeholder participation

75. The main formal platform for engaging the stakeholders is the Steering Committee (SC). The project in addition to the engagement of the government stakeholders as PSC level managed to bring on-board many other beneficiaries and decision-makers, including local Governments of Baghdad, Najaf and Karbala. The project also built ties the private sector companies. Strong bridges were built with local NGOs, mainly in Najaf, where the demonstration PV systems were established.
76. The PSC has representatives from different concerned ministries and departments The SC does not have members from civil society, NGOs, research institutions, development agencies, trade & industry bodies or academia. PSC meetings are happening regularly.
77. **Despite being a DIM project, the project management has been engaging relevant stakeholders quite extensively.** It has been obvious during the TE, and especially during the interviews, that stakeholders have been engaged constructively and this led to establish a case of ownership, it is noted that many interviewees were calling the project as "our project". **Active stakeholders' participation has been critical element in adopting the project outputs and technical advices.** Stakeholder engagement at an aggregate level has been rated as Highly Satisfactory.

3.1.4 Replication approach

78. The project was designed to adopt a bottom-up approach within the overall policy/investment framework that was envisaged to be developed to promote PV electricity generation at several sites in Iraq. Technical assistance for barrier removal and institutional strengthening to be provided under the project were to facilitate replicability by creating the required institutional, policy, and technical conditions which would enable the mobilization of additional investor interest in the development of further PV projects.
79. As soon as the 775MW package is installed and operationalised and following rounds come to implementation, **the results achieved due to project would be far exceeding the original targets in terms of installed solar PV capacities and sites**, thus ascertaining the replicability of the project approach and design.
80. **Replicability of the piloted PVs in Baytti project further into similar mega residential projects depends on the set of the incentives** that the government could offer to the residential developers. The project demonstrated the successfulness through the 6 PV systems pilot in Baytti using collected the PV data to enable evidence-based demonstration, however this is arguably not enough from the residential development point of view. They needed financial incentives that will cover the extra PV cost incurred.
81. Moreover, it was considered that the **lessons learned would be of great value to the neighbouring countries sharing similar resource base should they also decide to follow** and

to tap their respective solar potential for PV electricity generation. RCREEE indicated¹⁵, through this TE, that other countries in the region going through similar political set up to the one in Iraq, specifically Libya, are keen to learn from Iraq experience in establishing new PV framework in the country, and replicate this in their countries in a fit for purpose approach.

3.1.5 UNDP comparative advantage

82. UNDP has a clear comparative advantage as an executing agency of this project as UNDP has many years of experience in the region and in the country. As also highlighted in the Project Document, this project is relevant to the UNDP Country Program Document (CPD) (2011-2015) mandate through its strong emphasis on environmental governance, capacity development and technical training for the private sector in order to draft national policies are reviewed in compliance with internationally agreed clean energy targets. And also provide professionals with the necessary know-how and technical skills to advise developers and other decision makers about RE standards and to integrate them into national policies and legislations¹⁶. It also fits the UNDP's mandate in its CPD 2016-2020 through priority 2. Upgrade living standards and services provision for citizens¹⁷.
83. **UNDP Iraq managed to build on the regional experiences of UNDP** and tap on available expertise in UNDP regional offices. The project effectively builds on UNDP's strong experience in Iraq and other Arab countries, particularly Jordan, Egypt, Morocco and Tunisia where UNDP manages large RE portfolios in these countries. The UNDP CO was able to establish important linkages with these countries to exchange expertise and transfer best practices.
84. **The stakeholders have appreciated the opportunity to see on ground RE developments** in Jordan, Morocco and Egypt, and experts from these countries were invited to present their experiences to the Government of Iraq. Some of these linkages have sustained beyond the project boundaries for further regional partnerships, for example the Government of Iraq is now considering extending the partnership with RCREEE after being introduced by the project.
85. **The UNDP Country Office in Iraq was active in ensuring quality assurance, transparency and due process**, closely guiding and supporting the project management team to overcome bottlenecks and adopt appropriate adaptive management measures to achieve results. Staff and consultants were contracted according to the established Rules and Regulations of the United Nations and the financial transactions and procurement activities similarly followed due process and the same Rules and Regulations.

3.1.6 Linkages between project and other interventions within the sector

86. This has been the first project of its type (i.e PV) in Iraq, there has been few individual attempts to install solar at low scale level over the past decades. However according to PV solar Plan 2017-2020, Iraq has a target of installing 2240 MW solar PV energy by 2020. This indicates the

¹⁵ RCREEE indicated the regional replication potential when interviewed during this TE.

¹⁶ UNDP Iraq CPD document 2011-2015

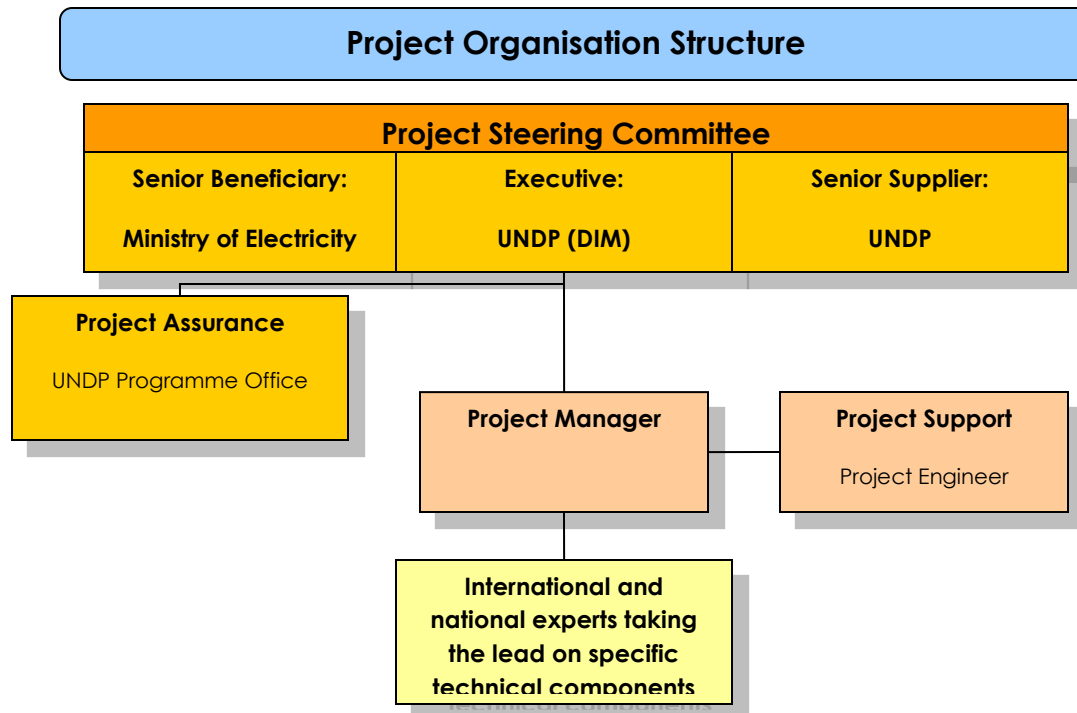
¹⁷ UNDP Iraq CPD document 2016-2020.

country's political commitment toward the deployment of RE, so it is envisaged for more projects to be established based on the PV regulatory framework established by this project.

3.1.7 Management arrangements

87. The project design has provided for a structured management arrangement. UNDP has the responsibility of Implementing Partner under the DIM modality.
88. UNDP CO, in close cooperation with the Ministry of Environment, has taken the responsibility for implementation of the project. The Ministry of Environment has nominated a high-level official as a UNDP Focal Point, who provides the Government oversight and guidance for project implementation. UNDP is responsible for disbursement of the funds and the achievement of the project goals, according to the approved work plan.
89. The project design provides for a full-time Project Manager and a full-time project staff to manage the project. Together as a Project Management Unit (PMU), they are responsible for the day-to-day management of the project.
90. The PMU recognised the need to more effective engagement of the ministry of Electricity given their mandate in PV development in Iraq, and therefore, **the PMU has effectively increased level of engagement if the MoE in the project in the day to day business.**
91. Another strategic partnership that was identified by the project team is to **engage with Prime Ministers Advisory Committee (PMAC)**. PMAC engagement has been very effective in driving high level adoption of the project products particularly as related to fast tracking the regulatory reform and new law. Also, in response to the request from PMAC, MoE established a special committee to review the draft grid code and recommended road map for implementation. As a result, the MoE has adopted the suggested codes and sent an official letter to all electricity directorates across the country requesting them to adopt the codes as well.
92. **The project established a Project Steering Committee (PSC)** as instructed in the project document, the PSC has been responsible for advising UNDP on management decisions for the project, in particular when guidance is required by the Project Manager. It ensures that required resources are committed and arbitrates on any conflicts within the project or negotiates a solution to any problems with external bodies.

Figure 1: The project governance and oversight structure



93. Project implementation has responded to changing conditions and risks, and taken advantage of opportunities for partnerships and actions that support the overall project objective.

94. These arrangements and additional partnerships established by the PMU has been effective and has worked well as far as progress towards implementation is concerned, especially when taking into account the security situation in the country, wherein the movements of the project team and the stakeholders within the country at times get restricted.

3.2 Project implementation

3.2.1 Adaptive management

95. Adaptive management, as described by the UNDP-GEF are changes made to the project in order to still achieve the outcomes and objective. It is not to be confused with doing something different to that which was set out in the Project Document.

96. The **project's management has been adaptive and was able to demonstrate flexibility in making changes if, and when, necessary to do so** in order to keep the project up to date and keep it capable of producing the desired outputs as envisaged originally. For example, engaging PMAC and MoE more intensively than initially envisaged in the project design was a successful attempt to adapt the realities on the ground, and emerged government structures (i.e PMAC).

97. The main formal platform for engaging the stakeholders is the Steering Committee (SC). As was mentioned in section 3.1.8, **the project in addition to the engagement of the government stakeholders as PSC level managed to bring on-board many other beneficiaries and**

decision-makers, including local Governments of Baghdad, Najaf and Karbala. The project also built ties the private sector companies. Strong bridges were built with local NGOs, mainly in Najaf, where the demonstration PV systems were established.

98. The UNDP project team realising the issues regarding installation of rooftop solar PV by Al Shafei at Baytti Complex, **took the adaptive measure by supporting installation of six such systems at Baytti.** This helped to establish some of the demonstration roof top solar PV facilities, which was one of the objectives of Outcome 1 of the GEF project. This adaptive measure also facilitated monitoring and evaluation of the performance of solar roof top type installations in the conditions of Iraq (Output 1.3).
99. The project design limited private sector engagement to Baytti project, presumably due to co-financing reasons at the time, however, during implementation, it was obvious the Baytti complex was nowhere close completion on time, the project took another adaptive measure by **diversifying the private sector developers available in the market to work closely with.**
100. This suggests that it was a thoughtful project, capable of resolving problems and acting intelligently even in the face of uncertainty when it comes to project management and stakeholders engagement.
101. However, there is one aspect of the adaptive management that could have been more effective, and that is the inception phase. **The inception phase was undermined and not properly utilised to review the project scope and adapt to emerged circumstances.** Despite that the project recognised the need to review some of the project indicators (mainly CO2 targets), this actually didn't happen at the inception phase, and only captured in the MTR.

3.2.2 Partnership arrangements

102. In addition to partnerships mentioned in 3.1.8 including with PMAC and others, **the project is a good example of establishing strategic partnerships at the regional level,** in addition to multiple partnerships established with regional best practice sources (such as JEREEF in Jordan), the project established a strategic partnership with the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE) to implement key deliverables under this particular outcome. RCREEE builds on its technical capacity to initiate and lead clean energy policy dialogues, strategies and capacity development in Arab states. It supports capacity development and learning, policies and regulations, research and statistics, and technical assistance in targeted countries. The project signed an agreement with RCREEE in 2017, and it has been effective since then in providing deep technical assistance to the project and deliver key results.
103. The partnership arrangements eventually distil down to individuals within those partner institutions whose willingness to interact with the project's activities. And very often these partnerships rely upon the goodwill of overworked project team who commit their time and often their own financial resources in order to lead in the project's activities successfully.
104. **Certainly, the PMU appears to have become a trusted source for the partners.** This has come strongly during TE interviews with stakeholders that the PMU has been, and still in some

cases, a trusted reference point when it comes to PV in Iraq. The PMU team members have been acknowledged by partners as technically-sound, trusted and engaging partners.

3.2.3 Feedback from M&E activities used for adaptive management

105. The M&E framework, comprising a plan and budget, is outlined in the Project Document (section 6 Pp. 53 – 57; Log-frame, section 3, Pp.42 – 44). Monitoring reports identified in the framework comprise the following:

- Inception Report, which should include a detailed Year 1 Annual Work Plan of activities and progress indicators, as well as an annual budget and M&E requirements to measure performance in Year 1.
- Annual Project Report (APR), or Project Implementation Report (PIRs), which is a GEF annual reporting requirement.
- Quarterly Progress Reports, which are provided to the UNDP CO and Regional Centre.
- Periodic monitoring through site visits: UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first-hand project progress.
- Mid-term of project cycle: The project will undergo an independent Mid-Term Evaluation at the mid-point of project implementation (insert date). The Mid-Term Evaluation will determine progress being made toward the achievement of outcomes and will identify course correction if needed
- Project Terminal Report, which is a comprehensive summary of all activities, achievements, shortcomings and lessons learnt prepared during the last three months of the project.
- Project Publications, which provide a key means of collating and disseminating the results of the project and lessons learnt concerning the main elements of the project strategy.
- Independent evaluations at mid- and end of term.

106. The Log-frame provides a results-based methodology for monitoring progress against targets, using a suite of supposedly SMART indicators that track the project's objective and outcomes. The results framework used GEF-recognised Tracking Tools for climate change mitigation project.

107. In this instance the **MTR report has recognised the weaknesses and anomalies contained within some targets in the Log-frame** and proposed changes (amendments and revisions to assumptions). These changes were recognised by the project steering committee however, they were not formally integrated into the Log-frame and the PIRs continued to report on the original indicators. This created uncertainty and inconsistency in project documentation.

108. It is not clear what is needed in order to formerly change indicators in a Log-frame, presumably this would need the endorsement of the RTA. However, given the high calibre of the PMU this has not affected the progress, performance and outcomes of the project.
109. The MTR made nine recommendations (5 of them relates to Log-frame changes) and there was a rapid and reasonable management response, providing actionable responses or rationale justification for those recommendations that the project would not follow. The project though didn't document responses in a proper management response plan, instead the plan to adapt the MTR recommendations has been documented in SC meeting and PIR. This is not to suggest that MTR recommendations were not responded to, but to say responses were documented differently.
110. On this basis **there is ample evidence that feedback from M&E activities was used in a robust and comprehensive way to adapt management.**

3.2.4 Project Finance

111. The total budget for the project was set out in the Project Document and gives a total budget of US\$ 35,192,473. This included US\$ 2,227,273 GEF grant, US\$ 215,200 in Implementing Agency funds (UNDP) and co-financing of US\$ 32,750,000.
112. As is typical of GEF projects, the co-financing provides a financial picture of a project that is actually much larger than the reality. The reality is that the most effect is garnered from the GEF fund and any cash co-financing. This is not to say that in-kind co-financing never has a positive effect upon a project, in certain circumstances it can have a profound effect. However, it is extremely difficult to account for in-kind contributions and even more difficult to attribute project impacts directly to this spending.
113. In case of this project, large portion of what is seen to be "in-kind" comes from the capital cost of the PV developments, the TE argues that this is indeed rather a cash contribution due to the direct nature of contributions toward the objectives and the fact that it is actually a massive cash investment.
114. It is clear that co-financing contributions have had a considerable and positive effect on the outcomes, and the project co-financing overall target has been achieved. Investments in PV channelled through the project in achieving 10.9 MW at the distributional level is estimated to be \$21 million, and for the upcoming utility scale of 775MW is \$700 million. These by far achieve the co-financing targets.
115. There is a plan to allocate 50 billion Iraqi dinar (eq. to \$42 million) in the national annual budget of 2020. However, the budget for 2020 has not passed parliament yet. Of which. the Government of Iraq has recently approved funding of \$20 million for Al-Zawra company to support local manufacturing of the PV panels, this will help to upgrade their production lines. In addition to funding of \$0.5 million for establishing a PV laboratory. The table below includes only what was estimated to have been actually achieved during the project lifecycle.
116. The project spent 99% of its GEF financial resources, specifically total of \$2,214,082.07 has been spent from GEF funding (only \$13,190.93 left overs). Th project provided a good model for delivering cost-effective outputs, and has procured the skills and expertise of UNDP to

contribute to the project delivery, whilst increasing Iraq Government's capacities for future PV investment. Efficiencies were also gained through building on national and regional capability, allowing the project to draw on a wealth of knowledge, skills and expertise available nationally and regionally especially through the active engagement of RCREEE. This model has achieved great deal of efficiency of financial resources spending.

Table 12 status of project co-finance

Co-financing (type/source)	UNDP own financing (mill. US\$)		Government (mill. US\$)		Partner Agency (mill. US\$)		Total (mill. US\$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants								
Loans/Concessions								
• In-kind support	215,200	250,000	750,000	3,000,000			2,965,200	3,250,000
• Cash contribution			20,000,000	21,000,000	10,000,000	10,000,000	30,000,000	31,000,000
Totals	215,200	250,000	22,750,000	24,000,000	10,000,000	10,000,000	32,965,200	34,250,000

3.2.5 Monitoring and evaluation: design at entry and implementation (*)

The design of the M&E framework at entry is rated as **Satisfactory** and its subsequent application during implementation is rated as **Satisfactory**.

Despite the weaknesses in the Project Document's log frame it provided a reasonable logical hierarchy for the strategy and sufficient indicators. The wording of the indicators could have been clearer and there needed to be a better capture of the adoption and utilisation of the project outputs. Notwithstanding these weaknesses, the PMU has used the log-frame carefully, has built in meaningful reporting in the annual PIRs. The project appears to have welcomed the MTR and used it to its full extent to scrutinise the project and make improvements.

117. The project document contained a Monitoring and Evaluation Plan and Budget that would be conducted in accordance with established UNDP and GEF policies and procedures. M&E activities, lead responsible parties, budget and timeframe were clearly identified in the Monitoring and Evaluation section of the project document. The project log-frame contains detailed indicators of achievement, means of verification, and assumptions and risks that provide milestones for measuring project implementation progress and performance.
118. **There were several weaknesses in the project's log frame** that have been outlined in MTR. The MTR suggested amendments on the project indicators. The TE notes that the project's log-frame is relatively conventional, or safe, and CO2 targets (direct and indirect) were far too ambitious and didn't take into account the timeframe needed to reach a stage of operations for utility-scale PV developments.

119. **Indicators defined under outcome 2 and 3 were output-driven** such as “Development of model contracts for power purchase agreements”, this indicator is limited to output and doesn’t give any insights on the outcome (impact), in this case would be number of PV project using the PPAs or government adopting the PPA provided by the project.
120. **In some cases, the indicator statement, baseline and targets don’t correspond to each other’s**, for example the first indicator under outcome 3 is “*Availability of individuals and organisations capable of supporting activity in the Iraqi solar market*”, and the target is “*Solar power market demand/industry response strategy developed for Iraq, informed by case studies from other countries with developed solar power industries, domestic market analysis, and clarification of Iraqi private sector opportunities for distributed solar PV power production. Iraq private sector and Government agencies exposed to all aspects of the industry (technology development, supply, servicing, financing)*”. The target statement is lengthy and contains multiple milestones where none of them actually correlates to the intent of the indicator i.e increase in the availability of a capable private sector players.
121. **The Monitoring and Evaluation has been adequately designed and implemented according to the GEF/UNDP practice** and in line with the monitoring and evaluation plan described in the Project Document. UNDP CO undertook effective and timely monitoring activities through quarterly and annual progress reports (APRs) as well as the Project Implementation Reviews (PIRS) submitted by the project team to the Project Steering Committee. An independent mid-term evaluation of the project was carried out in 2018. The Steering Committee met regularly and was informed of project progress. The Steering committee reviewed progress towards achievements and approved the Annual Work Plans and Budget.
122. The PIR ratings were generally consistent with those ratings made by independent evaluators at both MTR and TE stages. And the Tracking Tools were updated at MTR and TE stages as per GEF guidelines. Based on the above evaluation, the TE evaluators rate the Monitoring and Evaluation Design at Entry and Implementation as Satisfactory (S).

3.2.6 UNDP and Implementing Partner implementation / execution, coordination, and operational issues

Implementation by UNDP and the Implementing Partners is rated as **Satisfactory**.

The project has broadly achieved its outcomes and has embedded PV, to different degrees, within the project’s partner organisations through the policy, regulatory and planning framework. In many instances there is good evidence of changes in the institutional mindsets and operational cultures towards renewable energy in Iraq. The UNDP and partners have worked well together and when necessary the project has been adaptive to address shortcomings and incorrect assumptions within the project’s original design.

123. What is clear is that the project implementation and execution have followed the correct procedures and protocols for project assurance. As has been documented elsewhere in this report, the project board and steering committee met regularly, and the partners have

provided sound and timely decision-making and the PMU has provided the “glue” that has kept it all together in a coherent project management.

124. The role of the PMU in this cannot be overstated, but the partnership has also contributed to the achievements. A measure of this is that, as the project draws to a close, apart from the obvious exhaustion of the PMU, there are no signs of the usual project fatigue that often accompanies these projects as they come to an end. On the contrary, there is genuine enthusiasm and energy amongst to take this process to the next step.

125. Given the number of partners, the role of the MoHEN in ensuring policy conformity has also been an essential ingredient. As has the part that the UNDP CO has played in enabling a national identity and ownership of the project. Changes in Government at highest level within the partner institutions, alongside the security situation, had an impact on a number of occasions and slowed progress. However, these have largely been overcome by the hard work and persuasive nature of the PMU, not without taking a toll on the PMU, but still to good effect.

3.3 Project results

3.3.1 Overall results (attainment of objectives) (Satisfactory)

Overall results (attainment of objectives) is rated as **Satisfactory**.

The PV Solar energy sector in Iraq has clearly taken off, with a very effective public-private mechanisms catalyzed by the project. Government of Iraq has shown a willingness to take proactive action and invest in PV and reduce Green House Gas emission.

Progress towards outcome 1: The progress towards achievement of Outcome 1 is rated as satisfactory

Outcome 1: Investment in solar photovoltaic power technologies for distributed electricity generation for office, residential, small business and small town application.

Indicator & baseline	End-of-Project Target	Rating & status at MTR ¹⁸	Rating & status at TE
Volume of investments mobilized Baseline: 0	Target 1: Installation and operation of 5 MW of distributed, grid-connected PV.	Satisfactory On target to be achieved	Highly satisfactory – Target exceeded
	Target 2: Installation and operation of 4 utility-scale PV plants.	Moderately Satisfactory Not on target to be achieved	Moderately Satisfactory – on track to be achieved beyond project timeframe
	Target 3: Monitoring and recording operational data from	Satisfactory On target to be achieved	Moderately Satisfactory –

¹⁸ Conducted in July 2018.

	all the pilot solar PV installations to inform the development of future PV plants.	The MTR suggested to change the target to 160,000 tons of CO ₂ (from 741,622 tons of CO ₂) as a subsequent change to recommendation #1 of the MTR to change the target for installation and operation of utility-scale PV plants to 4 (from 16 in the project document). The MTR also suggested dropping the word "further" from the statement of the indirect target	achieved for PV at the distributional scale
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Target 1

126. The project has provided 6 pilot solar PV rooftop installations at Baytti complex aggregating a total capacity of 30 KW. The project envisaged establishment of 5 MW of distributed rooftop solar PV capacity at Baytti Residential Complex in Najaf, being constructed by Al Shafei (a private-sector conglomerate that is developing the Baytti Complex). As per the project document the funds required for establishment of 5 MW of distributed solar PV capacity were to come from Al Shafei as co-finance.
127. These six grid-connected solar installations in Baytti are fully functional and are connected to the internet for performance (power generation) data storage and online access for all related partners. And have given Baytti practical guidance to implement their commitment with the local authority in Najaf to complete their 5 MW plan of distributed, grid-connected PV.
128. However, due to the hit taken by the economy due to the security reasons and the fall in the prices of the crude oil, real estate sector has been among the most affected sectors due to these harsh economic conditions. Iraq has suffered from instability and wars, which has led to a continued deterioration in its housing sector¹⁹.
129. The MTR concluded that the construction of the houses at Baytti complex is much delayed and is unlikely to be completed before the end of the implementation period of the GEF solar PV project. As a result, the MTR recommended to remove the word "Baytti" from the target statement, which means diversification of the residential projects that the GEF project could work with.
130. Nonetheless, the project demonstration activities of the 6 pilots resulted in further adoption of the selected inverter technology, for example the new PV systems in the Ministry of Higher Education and Scientific Research as well as Ministry of Electricity have used the same inverter technology.
131. The project team has opened the collaboration horizon with other private sector operators (other than Al Shafei and Baytti Complex) to facilitate installation of more solar PV roof top installations for residential sector and small offices. For example Al-Talib and Infinity Green Power companies were heavily engaged in training and awareness activities, and Faith Al Ghadeer company was supported in the design of solar energy installations for hotels and irrigation. The plan has not been implemented yet.

¹⁹ UN-Habitat, (2003). Iraq Reconstruction plan - Shelter and Urban Development.

132. The Council of Ministers Secretariat (COMSEC) has authorized different ministries for solar PV installations on their premises with technical support from Al-Zawra State Company. The funds for such solar PV will come from the respective budgets of the ministries. As a result a number of ministries, with technical support from Al Zawra has initiated the process of installing solar PV in their premises. The project supported this decision by providing technical advices to individual project including advice on the best technology and the operation model.

133. The total solar PV capacity under these projects is about 10,888 KW (~ 10.9 MW), these projects are:

Table 13: List of PV projects at the distributional level supported by the project ²⁰

Project	Capacity KW	Operation month	City	MWh generation over 20 years (excluding generated to date)	MWh generation to the date of TE ²¹	Estimated Co2 reductions in 20 yrs (ton Co2) (excluding generated to date)	Co2 reductions to the date of TE (ton Co2) ²²
Solar Rooftop systems at Baytti Complex	30 KW	June 2016	Najaf	840.8	210.2	431	107.76
Solar PV system at Al Mansour Factory	5 KW	May 2016	Baghdad	140.7	34.27	72.22	17.59
Solar PV research station at MoST	3 KW	August 2016	Baghdad	85.31	19.69	43.78	10.10
Solar PV System at Ministry of Electricity (MoE) premises	1,000 KW	October 2017	Baghdad	30,368	4,672	15,565.73	2,394.73
Universities (Middle Technical University in various sites.	1,000 KW	June 2018	Baghdad Kufa	31,536	3,504	16,164.41	1,796.05
Private sector (Al Traib for Smart Solutions, Infinity Green Power, Baghdad	3,000 KW	January 2018	Baghdad Erbil Anbar	92,418	12,702	47,370.69	6,510.66

²⁰ Calculations in this table are in line with GEF (2015), GUIDELINES FOR GREENHOUSE GAS EMISSIONS ACCOUNTING AND REPORTING FOR GEF PROJECTS. Assumptions: PV capacity factor: 20% Iraq Emission Factor: 0.51257 Kg Coq/kWH.

²¹ Until June 2020

²² Until June 2020

Renewable Energy and Sustainability Center, Faith Al Ghadeer)			Mosul				
Supplying, installing and operating solar energy systems for citizens over 12 governorates	5,850 kW	To be implemented August 2020	12 Governorates excluding KRI	204,984	0	105,068.65	0
Total	10,888 KW (~ 10.9 MW)			360,372.84	21,142.16	184,716.52	10,836.89

Table 14 summary of lifetime GHG emission reductions

Emission type	Reduction category	GHG reductions (ton co2)	Source	Methodological notes
Direct emissions	Direct GHG emissions avoided at the time of terminal evaluation	10,836.89	Resulting from implementing 5.03MW already under operations (5.85MW project that will start operation in Aug 2020 is <u>not</u> included)	PV capacity factor: 20% Iraq Emission Factor: 0.51257 Kg Coq/kWH.
	Lifetime direct GHG emissions avoided after the time of terminal evaluation	184,716.52	Resulting from 10.9MW operations over the remainder of 20 years (i.e excluding the project lifetime emissions reductions which are represented under "Direct GHG emissions avoided").	
Total lifetime direct emission reduction		195,553.41		
Consequential emissions	Lifetime consequential GHG emissions avoided (bottom-up)	13,560,142	Resulting from 20 years operation of 755 MW starting from 2020	PV capacity factor: 20% Iraq Emission Factor: 0.51257 Kg Coq/kWH.

	Lifetime consequential GHG emissions avoided (top-down)	5,916,000	- The targeted potential for renewable energy in Iraq is 5% of generation capacity by 2030, generating some 2.9 TWh/year.	- Grid emission factor of 0.51kgCO ₂ /kWh - Applying a conservative GEF Causality Factor of 40%, corresponding to Level 2 ("the GEF contribution is modest, and substation indirect emission reduction can be attributed to the baseline")
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Figure 2 pictures of key sites



Solar energy unit at Al Mansour Factory – Baghdad provided by the project May 2016



One of the six units at Bayti Housing Complex – Najaf province provided by the project June 2016

134. The Directorate of Renewable Energy at MoST is collecting and monitoring the performance of the solar PV systems. Al Mansour is comparing the data gathered from the solar installation provided by the project with its own locally assembled solar panels. The objective is to support the government's initiative to monitor the performance of grid connected solar systems and to leverage the lessons for enhancing performance and ensuring the quality of the state-run company. Two different technologies, which are used in Baytti and Al Mansour are being compared.
135. The project team in cooperation with the Ministry of Science and Technology (MoST) analysed the productivity of the unit at Al Mansour between June 2016 and the end of May 2017. Based on the lessons learned, specific recommendations were made aiming to improve the performance of solar systems in accordance with the Iraqi environmental conditions, including the high temperature during the summer season and high concentrations of dust.
136. In conclusion, the project has achieved and by far exceeded the 5 MW target at the distribution level, more importantly, there is clear evidence that the project created important momentum for future installations for residential, business and offices installations.

The momentum is grounded on the facts that new legal framework has been established, incentives created, and technical capacities built under outcomes 2 & 3 of this project.

137. The progress towards achievement of Target 1 is rated as Highly satisfactory .

Target 2

138. Outputs 1.4 to 1.5 for Outcome 1, relates to Target 2. Target 2 is about creation of demonstration for grid connected utility scale solar PV facilities.
139. The project design envisaged establishment of 16 such utility scale solar PV facilities during project implementation. Realising that establishment of 16 utility scale solar PV plants within the implementation period of the GEF project is bit over ambitions to achieve, the MTR suggested changing the target to 4 (from 16 provided in the log-frame) as being more realistic achievable target in the project timeframe especially when considering the lengthy procurement process of large PV investments. This decision started by stakeholders at the time of the inception of the project, did not get formalised subsequently (probably due to an oversight) until MTR.
140. Despite firm commitment from the Ministry of Electricity (MoE), installation and operation of planned utility-scale PV plants did not materialise yet. The reason for this was mainly due to the failure of delivering round 1 (970 MW) of the bidding process for engaging private sector to establish utility scale PV projects. In fact, the GEF project played a pivotal role in influencing the decision to cancel round 1 due to inappropriate bidding process.
141. Round 1 process was led by MoE and it evidently lacked for the key principles and standards to achieve sustainable PV projects, and ended up with the selection of unqualified companies who struggled from the beginning and were not able to pursue their projects. The project intervened positively, and assessed the bidding process for utility scale program, and found that it needs several enhancements to the tendering processes, for example, by including separate prequalification phase to ensure the participation of experienced and serious companies and adapting the power purchase contract to the international standards and best practice.
142. Other enhancements have been suggested by the project and also largely adopted by the Government such as:
- Development of efficient, transparent and well-structured scheme for projects development.
 - Apply the program through successive rounds to gain experience and achieve successively better prices.
 - Multi-layers filtering process to ensure the credibility of developers including; prequalification criteria, short listing, proposal bonds to ensure seriousness for the applied companies, separate technical and financial offers simultaneously presented and sequentially evaluated and use point system for evaluation.
 - Use auctioning approach for large projects, which ensure competition to achieve the lowest possible prices

- Extend the contracted period to 20 or 25 years.
- Completeness and adequacy and up to the international best practices contractual documents (e.g. power purchase contract, usufruct agreement, interconnection agreement, implementation agreement, direct agreement (guarantee)).

143. The suggested enhancements on bidding process have been largely adopted by the Iraq Government in the following round of bidding, this led to more efficient, transparent and well-structured scheme for projects development. The bidding process now includes multi-layers filtering process to ensure the credibility of developers including prequalification criteria.

144. The project, in cooperation with RCREEE, provided MoE with PPA template and models from the region to guide the relevant departments in MoE in preparation of a transparent, clear and comprehensive PPA process. The Iraq PPA was compared to best practices and areas of improvements have been defined accordingly. The project then developed PPA template up to the best practices and standards and informed by extensive analysis done²³.

145. As a result of the project advise, the MoE decided to cancel 4 signed contracts from round 1, and move to round 2 equipped with enhanced bidding process that is informed by best practices from the region and globally.

146. This also meant delay in achieving round 1 target of 970 MW. Up till the point of the TE, there is no utility scale projects up to the installation and operation stages yet, however round 2 has already started in 2019, and 40 companies have been longlisted from the prequalification scheme to deliver a total of 775 MW distributed across the country.

147. The evaluator was not able to gather further details about the round 2 due to confidentiality of the bidding process at this stage, however, the MoE advised that contracts are expected to be signed by the end of 2020, and installations may start in 2021.

148. The project has evidently been instrumental in delivery of the 775 MW projects in terms of providing technically sound advice to the MoE as explained above. The MoE has acknowledged the significance of the GEF project contribution to these projects and emphasized their commitment to deliver round 2, and then round 3 afterwards.

149. The progress towards achievement of Target 2 is rated as moderately satisfactory.

Target 3

150. Outputs 1.5 for Outcome 1, relates to Target 3. The idea is to monitor and record operational data from all the pilot solar PV installations to inform the development of future PV plants.

151. The PV units in Baytti are monitored online and the data is documented on hourly, daily, monthly and annual basis. The access to the online monitoring and the documented data

²³ Power Purchase Contracts. RCREEE & UNDP, 2017.

has been shared with the relevant stakeholders. Similarly, the PV unit in Al Mansour Factory goes through the continued online monitoring.

152. With 1 year of production data for Al Mansour, MoST prepared a report on the efficiency of the PV unit. The main findings showed evidence that the productivity of the solar PV installation in Al Mansour Factory had 80 % efficiency compared to simulated production data. Further improvements were recommended with regard to changing the tilt angel of solar panels twice a year, setting up a timetable for cleaning the solar panels and solving the interruption of the grid through cooperation with the Electricity Distribution Department in the area.

153. The progress towards achievement of Target 3 is rated as moderately satisfactory.

Progress towards outcome 2: The progress towards achievement of Outcome 2 is rated as Satisfactory

Outcome 2: Encouragement of investments in solar power technology in Iraq and consumer uptake of solar appliances through policy reform and financial incentives.			
Indicator & baseline	End-of-Project Target	Rating & status at MTR²⁴	Rating & status at TE
Extent to which RE policies and regulations are adopted and enforced Baseline: There have been early-stage discussions between MoE and UNDP on net-metering. There have been no concrete steps or commitments.	Target 4: Development and implementation of a grid code for distribution and transmission (for small-scale distributed generation and larger utility-scale generation).	Satisfactory On target to be achieved	Satisfactory
	Target 5: Design and implementation of a process for IPPs to engage in standardized PPAs with the Ministry of Electricity, to acquire generation licences and to inter-connect with the grid.	Satisfactory On target to be achieved	Satisfactory
	Target 6: Development of model contracts for power purchase agreements.	Satisfactory On target to be achieved	Satisfactory
	Target 7: Implementation of phased fiscal incentives for PV uptake, including partial removal of import taxes on solar panels.	Satisfactory On target to be achieved	Satisfactory
	Target 8: Design of a feed-in tariff for renewable energy IPPs with appropriate pricing calibration, geographical zoning and regression schedule, and packaged as a NAMA.	Satisfactory On target to be achieved	Satisfactory

²⁴ Conducted in July 2018.

	Target 9: Evaluation of net-metering options for industrial and residential applications.	Satisfactory On target to be achieved	Satisfactory
	Target 10: Evaluation of a range of policies for specific circumstances, such as tenders for large solar installations (suitable for Iraq's environment).	Satisfactory On target to be achieved	Satisfactory
	Target 11: Support to implementation of the feed-in tariff and/or net-metering scheme.	Satisfactory Achieved	Satisfactory
	Target 12 ²⁵ : Renewable energy database (solar map) containing site-specific data on RE potential to facilitate investment decisions	Satisfactory On target to be achieved	Satisfactory
	Target 13 ²⁶ : Development of the feed-in tariff as a policy NAMA, with corresponding baseline, MRV and institutional systems.		

Output 2.1

Target 4

154. Activity 2.1.2 (Target 4) pertains to development and implementation of a grid code for transmission and distribution of solar PV based power.
155. The project, in collaboration with RCREEE, developed Iraq PV Grid Connection Code. The objective of the Solar Photovoltaic (PV) Power Plants Connection Code is to determine the technical requirements for interconnecting PV Power Plants with Iraqi Power System to ensure the safe operation of Iraqi Power System. Notwithstanding the provisions of the Republic of Iraq Grid Code, the PV Code specifies the special requirements for the connection of PV Power Plants to Iraqi Power System. The PV Code and the Grid Code are two complementary documents²⁷.
156. The PV Code shall apply to all PV power Plants to be connected to the Iraqi Power System from the date the Code is enforced. This Code applies to a) PV Power Plants directly connected to 11 KV and 33 KV of the Distribution Networks (DPV), and b) PV Power Plants directly connected to Transmission network (TPV).
157. The code was discussed extensively with PMAC, MoE and other relevant authorities and stakeholders through bilateral consultation and workshops held in Baghdad and Amman.

²⁵ A new target added by MTR

²⁶ A new target added by MTR

²⁷ Iraq PV Grid Connection Code. RCREEE & UNDP, 2017.

The code has been reviewed by Iraqi engineers and experts nominated by the MOE. The project has managed to sensitize the higher authority and official order was issued to MOE for effective implementation of the grid code. In response to the request from PMAC, MoE established a special committee to review the draft grid code and recommended road map for implementation, the committee recommended adoption of the code. As a result, **the MoE has adopted the suggested codes and sent an official letter to all electricity directorates across the country requesting them to adopt the codes.**

158. The project developed guidelines to connect RE units into networks harmonizes and standardizes the effort, technical requirements, and contractual issues towards increasing the connection of RE into power system's networks in Iraq²⁸.

159. The progress towards achievement of Target 4 is rated as Satisfactory.

Target 5

160. Target 5 for Output 2.1 of the project pertains to design and implementation of a process for IPPs to engage in standardized PPAs with the Ministry of Electricity, to acquire generation licences and to inter-connect with the grid.

161. The project assessed the existing process of engaging IPPs, identified the gaps, and provided advise on the course of actions that need to be taken in order to enhance the process of IPP engagement.

162. The project delivered the RE guidelines to connect RE units into networks to harmonize and standardize the effort, technical requirements, and contractual issues towards increasing the connection of RE into power system's networks. This regulatory framework consists of technical framework (Grid Code, Distribution Code, and PV Code which is the focus of this report) and Contractual framework (contractual contracts dealing with technical issues stated in the technical codes; Network Connection Contract and Network Access Contract) and other network regulations (connection charges, Network Access Tariff, and Network Access Priority). This guideline for PV integration into grids sets the borderline of each entity (governmental, networks operators, PP, and customers as well) involved in activities related to RE integration into the Iraq's electric networks.

163. The project conducted capacity building activities for the Iraqi officials to support and establish a transparent and attractive process for IPP engagement. A series of exposure visits of the key decision makers in Iraq was organised as part of South-South Cooperation to Morocco, Egypt and Jordan. In addition to that, workshops and events were held locally within the country and abroad targeting technical staff from various ministries, private sector, academic institutes and NGO's. The participants gained knowledge on how to bridge the gaps of the current PPA process.

164. The progress towards achievement of Target 5 is rated as Satisfactory .

Target 6

²⁸ Guideline for Renewable Energy (Photovoltaic (PV)) Integration into Grids. RCREEE & UNDP, 2017.

165. target 6 for Activity 2.1.4 for Output 2.1 of Outcome 2 pertains to development of a model power purchase agreements.
166. The project, in cooperation with RCREEE, provided MoE with PPA models from the region to guide the relevant departments in MoE in preparation of a transparent, clear and comprehensive PPA process²⁹.
167. Acknowledging that the template of the PPA not only takes into consideration the recent improvement in renewable energy and the opportunities in Iraq but also the general investment laws in order to provide a clear and standardized PPA that will encourage the investors. The project has delivered a report that gives an overview of Power Purchase Contracts concepts, types, key factors of success, besides the international best practices and lessons learnt.
168. The Iraq PPA was compared to best practices and areas of improvements have been defined accordingly. The project then developed PPA template up to the best practices and standards and informed by extensive analysis done³⁰.
169. At the time of this evaluation, the new contracts are yet to be signed by the Government of Iraq based on round 2 bidding process, and the evaluator was told that it is intended to use the project PPA template model.

170. The progress towards achievement of Target 6 is rated as Satisfactory.

Target 7

171. Target 7, Activity 2.1.5 for Output 2.1 of Outcome 2 relates to development of a fiscal incentive for promotion of solar PV in Iraq.
172. The project worked with RCREEE to review best practices at the regional and international levels of financial and fiscal incentives for PV increased uptake, the best practice report offered overview of various incentives used to facilitate the investment in renewable energy technologies and/or conservation of conventional energy.
173. In addition to this, the report identified incentives intended to attract the private sector's investment in the energy markets. It is noted that the report didn't discuss the legal, regulatory, political, administrative barriers and opportunities in Iraq to incentivise the RE market³¹.
174. As one of the results of the continued advocacy and technical advisory support by the project, the Government of Iraq implemented number of the incentives already such as:
 - Waiving the imported RE equipment from all kinds of taxes and customs.
 - RE investors are income tax exempt for the first 10 years of operations

²⁹ Power Purchase Contracts. RCREEE & UNDP, 2017.

³⁰ Draft PPA template for Iraq

³¹ Best Practices at Regional and International Level of Financial and Fiscal Incentives for PV Increased Uptake. RCREEE & UNDP, 2017,.

- RE investors can lease piece of public land at favourable price, only 2% of the land's monetary value
- The PPA are based on "take or pay" basis, which guarantees that the Government will buy 100% of the investor production. This means that 100% of the production is guaranteed to be sold, which helps improve the feasibility of the projects.
- In addition, all the investment and business incentives decided by Council of Ministers in 2019 apply on the RE investors, these include long list of incentives such as residence of foreign investors, loans incentives and others³².

175. The progress towards achievement of Target 7 is rated as Satisfactory.

Target 8 & 11

176. Target 8, Activity 2.2.1 for Output 2.2 of Outcome 2 is focus on Design of a feed-in tariff for renewable energy IPPs with appropriate pricing calibration, geographical zoning and regression schedule. And target 11, Activity 2.2.4 for Output 2.2 is to support implementation of the feed-in tariff and/or net-metering scheme in Iraq.
177. As for the Feed in Tariff (FIT) mechanism, **the project conducted analysis of the best practices, the barriers, opportunities and applicability to implement the FIT in Iraq.** It was found that FIT is suffering from shortcomings and has limited adoptability to the rapidly developed technology as well as prices. For example, FIT has higher price levels compared with competitive schemes as it is less flexible in case of rapid reduction in market prices and such higher price represents a burden to consumers, or utility budgets (based on the scheme design). On the other hand, competitive schemes such as auctions allow true price discovery, which reduce the cost and provide greater control over quantities and possibly location of plants. Therefore, the renewable energy market has been witnessing a growing shift from feed in tariff towards more market driven mechanisms to expand their RE markets, the project provided.
178. Informed by these findings and learning from international experiences, **the project advised that FIT is not presently the most suitable solution to promote PV in Iraq for medium and large-scale power plants,** as more competitive mechanisms such as tendering and auctioning would allow better management of RE growth rate and price reduction and attract trustworthy investors that would commit to completing and operate projects. In addition, current electricity infrastructure represent a barrier for developing such incentive at national level.
179. Nonetheless, for small-scale cases, a FIT scheme tailored to Iraqi context could be an appealing mechanism to promote the uptake of renewable and low-carbon electricity generation technologies. However, the grid availability and stability, as well as attractive electricity tariffs are the fundamental parameters for the introduction of the FIT for small scale and decentralized programs. Given the current situation in Iraq, it will be necessary to overcome challenges such as reinforcing the electricity infrastructure needed for a stable

³² Decision of council of ministries number 245 for 2019.

energy exchange, reforming low voltage tariffs subsidies and strengthening metering and collection rate. These prerequisites will minimize the risks on distribution system operators, revealed currently by the very low tariff levels applicable. Otherwise, these companies must be supported to have liquidity and financial comfort to bear the financial burden caused by the establishment of FiT scheme.

180. RCREEE and UNDP **developed an excel based financial model to compute feed-in-tariff & net metering based on a set of technical parameters and the desired IRR (Internal Rate of Return)**. RCREEE has also carried out a case study for Feed-in Tariff in Iraq and made recommendations regarding the applicability of a Feed-in Tariff Scheme³³. The government has since ever been using these tools.

181. Progress towards results for Target 8 & 11 is rated as Satisfactory.

Target 9

182. Target 9, Activity 2.2.2 for Output 2.2 of Outcome 2 of the project is supporting development of the option of net-metering for industrial and residential users of electricity.

183. As for net metering, **the project delivered an overview on the net metering scheme's definitions, process and regulations, methodology of customers' compensation and its tariff level, additional incentives given to consumers (if existing), and existing projects under this scheme through various case studies in many countries around the world**. Eight case studies are illustrated: five Arab countries (Egypt, Jordan, Lebanon, Palestine, and Saudi Arabia), one European country (Italy), and USA (California and New Jersey)³⁴.

184. Informed by the market analysis, **the project recommended to resort to a net-metering mechanism that would rely mainly on electricity balance settlements rather than financial transactions**. The project provided robust guidance on net-metering mechanism to be designed taking into consideration the country context and specificity in order to achieve planned goals.

185. RCREEE has also developed an excel based financial model to demonstrate financial viability of the concept of net metering for different operating conditions and tariffs.

186. The project supported first ever installation of net metering introduced in Iraq by providing 10 bi-directional meters which has been installed in Baytti (six units), solar site at Al-Mansour (one unit), MoST (one unit) and the rest two for the solar PV site at MoE.

187. Progress towards results for Target 9 rated as Satisfactory.

Target 10

188. Target 10, Activity 2.2.3 for Output 2 of the project is focused on evaluation of a range of policies for specific circumstances, such as tenders for large solar installations (suitable for Iraq's environment).

³³ MTR report, 2018.

³⁴ Assessment and Evaluation of Lessons Learnt from International and Arab Countries Experiences in Applying Net Metering Schemes. RCREEE UNDP, 2017.

189. The government has adopted a bidding process for tendering the large scale projects. The proposed contracting period is 15 years. No sovereign guarantee is offered, in replacement a revolving letter of guarantee covering the payments for six months is offered. The Ministry of electricity concluded the competitive bidding process of the first project of 50 MW PV, after receiving technical and financial proposals from unlisted developer.
190. **The project analysed the work being done so far, identified the challenges and proposed** a national solar program, to enable a quick market development, which consist mainly of two components: utility scale and distributed PV programs³⁵.
191. The project also assessed the bidding process for utility scale program, and found that it needs several enhancements to the tendering processes, for example, by including separate prequalification phase to ensure the participation of experienced and serious companies and adapting the power purchase contract to the international standards and best practice.
192. The project seized the opportunity to evaluate the PPAs signed by the MoE for the large scale solar plant in Muthana. The deeper knowledge and understanding of this evaluation are leveraged in the development of a tender model suitable for Iraq's investment environment.
193. **The suggested enhancements on bidding process have been largely adopted by the Iraq Government** in the following round of bidding, this led to more efficient, transparent and well-structured scheme for projects development. The bidding process now includes multi-layers filtering process to ensure the credibility of developers including prequalification criteria.
194. In addition to deliverables under targets 8&9 above (Feed in Tarif and Net Metering), the project delivered an assessment of the status of renewable power context in Iraq. It includes general overview of the power sector and current share of renewable's power, associated electricity infrastructure, solar resources potential, electricity markets and policy frameworks, the general RE investment climate, institutional capacity and knowledge requirements³⁶.
195. The study is not limited to the inventory of the electricity sector in Iraq, it has been extended to a deep analysis of the key elements and necessary infrastructure required to promote PV in Iraq. The report includes the proposal of a set of recommendations to achieve PV projects objectives and goals.
196. For the first time ever an Iraqi RE law was drafted by the project which is now under revision by MoE and council of ministries. The project sought further support from PMAC to fast track the process of finalizing the draft RE law. The cabinet has approved the law and passed it on to the National Shura Council seeking its approval prior sending it to Parliament, and the council has recently approved the law. The draft is expected to be sent to the parliament through the Iraqi cabinet when political situation allows.

³⁵ Recommended Action Plan for Renewable Energy Deployment in Iraq. RCREE & UNDP, 2018.

³⁶ Renewable Energy Context in Iraq. RCREEE & UNDP, 2017.

197. The project provided an overview of the most successful laws, executive regulations and policies currently applied in the renewable energy sector in the Arab region. Furthermore, the report aims at helping the Iraqi government in planning a national strategy to raise awareness on the importance of renewable energy³⁷.

198. Also for the first time in Iraq, there is a clear institutional framework defining the roles and responsibilities among Government agencies and private sector institutions in relation to the PV energy. Within the MoE a Renewable Energy and Energy Efficiency Department (REEED) was established during the age of the project.

199. The progress towards achievement of Target 10 is rated as Satisfactory.

Target 12

200. Output 2.3 of the project calls for development of solar map of Iraq containing site-specific data on solar PV potential to facilitate identification of suitable sites and facilitate investment decisions. Target 12 is to establish a renewable energy database (solar map) containing site-specific data on RE potential to facilitate investment decisions

201. A solar map for Iraq has already been developed by RCREEE in collaboration with International Renewable Energy Agency (IRENA) and it is now integrated into the Global Atlas³⁸. In addition to the solar radiation components and altitudes values, the solar atlas contains land cover type; utilities source point and electric lines to locate a PV power plant not too far from a connection point; roads to locate a PV power plant in a serviceable location; slope to exclude zones which are too steep and information about important natural and heritage sites in Iraq to be considered. Input data into the Atlas was collected from google maps and other sources, and could have benefited from ground truthing process.

202. The solar map is now particularly helpful to PV investors in Iraq to identify Iraq's best solar resources, informing and facilitating renewable energy planning across the country. This will, in return, increase confidence in investment and feasibilities.

203. The progress towards achievement of Target 12 is rated as Satisfactory.

Target 13

204. As a part of the project, it is envisaged to develop a FiT NAMA project to support larges uptake of solar PV in the country. Target 13 is to develop a feed-in tariff as a policy NAMA, with corresponding baseline, MRV and institutional systems.

205. With an objective to complete registration of a FiT NAMA in the UNFCCC NAMA registry. The project built the capacity of the Ministry of Health and Environment (MoHEnv) to promote climate mitigation and preparation for climate financing. The project facilitated the necessary training on NAMA and ensured wider discussions on the NAMA priorities.

³⁷ Analysis of applicable laws and Executive Regulation, Best Practices and Lessons Learned in the Arab Region. RCREEE & UNDO, 2017

³⁸ <https://globalsolaratlas.info/download/iraq>

206. With technical support from UNDP, the MoHEN has undertaken a series consultation meetings and training workshops to build the capacity of the national team for a better understanding of NAMA and to pave the way for the implementation of the mitigation actions in Iraq.
207. The project supported the Ministry of Health and Environment (MoHEN) as national NAMA Approver and UNFCCC focal point to lead the national team to address NAMA roadmap and identify stakeholders and priority of implementation. **A draft NAMA Roadmap was developed** involving the key stakeholders, experts, academia and civil society organization. The road map defined the institutional arrangements and NAMA readiness sectorial programme, as well as NAMA design elements and outline template³⁹. Priority NAMA project is currently going through the accreditation process.
208. Efforts were made to enhance knowledge and understanding on NAMA registry as well as to clarify the roles of NAMA developers and NAMA approvers. The project facilitated stronger collaboration between the ministries of environment and electricity to work together and create conditions for Iraq's registration of FIT NAMA in the NAMA registry with the objective of finding a suitable donor agency to support implementation of the proposed FIT NAMA.
209. The experience of Malaysian FIT NAMA was discussed and reviewed as a model. Led by the MoHEnv, a government-wide approach was followed for NAMA process in Iraq which involves climate relevant ministries including the Ministry of Oil, Ministry of Industry, Ministry of Transportation, Ministry of Housing and Construction, Ministry of Higher Education, Ministry of Agriculture, and the Environmental Commission in the Kurdistan region. The project provided technical support and guidance for the Iraqi delegation to organize side events during COP in Morocco where Iraqi climate experts and officials were exposed to innovations, best-practiced solutions, and the emerging carbon markets, and potential investors gathered during the global event.
210. Linked with the ongoing initiative on NAMA and climate financing, the project organized two technical meetings during the reporting period to sensitize and bring the counterparts and stakeholders together to discuss and prepare for Iraq's access to innovative climate financing. The Government of Iraq has been supported to formulate its country readiness program for accessing GCF (Green Climate Fund) opportunities. To this end, a formal proposal has been formally submitted to GCF Secretariat by the country GCF focal point. This effort will help Iraq to accomplish a range of nationally driven activities over the next two years that will help prepare the country for constructive engagement and effectively utilization of GCF resources.

211. The progress towards achievement of Target 13 is rated as Satisfactory.

³⁹ Nationally Appropriate Mitigation Action (NAMA) Roadmap in Iraq, 2016.

Progress towards outcome 3: The progress towards achievement of Outcome 3 is rated as Satisfactory

Outcome 3: Facilitation of private sector capacity for technology development, innovation and servicing in the solar power industry, through technical capacity building and domestic market analysis.			
Indicator & baseline	End-of-Project Target	Rating & status at MTR⁴⁰	Rating & status at TE
Availability of individuals and organisations capable of supporting activity in the Iraqi solar market. Baseline: No effective capacity building exists for the industry. There are few industry players	Target 14: Solar power market demand/industry response strategy developed for Iraq, informed by case studies from other countries with developed solar power industries, domestic market analysis, and clarification of Iraqi private sector opportunities for distributed solar PV power production. Iraq private sector and Government agencies exposed to all aspects of the industry (technology development, supply, servicing, financing).	Satisfactory On target to be achieved	Satisfactory
	Target 15 Development and delivery of certified technical training on solar PV technologies (hybridization, supply, service) for emerging private sector companies Target 16 Development and delivery of dissemination sessions on future IPP involvement in the electricity supply network, including relationships with technology firms and Government agencies, feed-in tariffs, and net-metering options.	Satisfactory On target to be achieved Satisfactory On target to be achieved	Moderately Satisfactory – partially achieved Satisfactory

Target 14

212. At the distribution level market, the project has successfully completed a comprehensive study which included assessment of the market demand of solar power, industry response strategy, and domestic market analysis. Representatives of small and local IPPs such as Al-Traib Company, have been consulted to identify the current barriers and possible actions in

⁴⁰ Conducted in July 2018.

order to remove the obstacles. Lessons learned from the region including Morocco, Egypt and Jordan, are being leveraged in the process

213. The assessment study was the right first step towards delivering market transformation strategy that define Iraq priorities in advancing the RE market. The project developed in cooperation with RCREEE the “Action Plan for Renewable Energy Deployment in Iraq.
214. database of solar market participants in Iraq (installers, manufacturers, importers, etc.) to help provide targeted assistances and capacity building to these entities. It is worth mentioning though that the new RE law forms a legal framework for the RE market to grow.
215. At the utility-scale market level, as explained above, the project has provided support to the Iraqi Government on the best practices in towards growing the RE market at that level including the RE law, grid code and standards of large-scale tendering.
216. It is evident that the RE market remains primitive in Iraq, and challenged by lack of capacities, limited incentives and need a more sophisticated understanding of the techno-economic aspects of the industry.
217. There is a plan to allocate 50 billion Iraqi dinar (eq. to \$42 million) in the national annual budget of 2020. However, the budget for 2020 has not passed parliament yet. Of which, the Government of Iraq has recently approved funding of \$20 million for Al-Zawra company to support local manufacturing of the PV panels, this will help to upgrade their production lines.

218. The progress towards achievement of Target 14 is rated as Satisfactory.

Target 15 & 16

219. The project delivered RE capacity needs assessment with intent to improve renewable energy training conditions and then enhance PV deployment in Iraq, as capacity development is always seen as a measure of support for national strategies and policies⁴¹.
220. The capacity needs analysis aimed to
 - Inform decision makers in Iraq on the context and status of RE capacity development activities;
 - Evaluate the current situation of PV training activities and highlight the real needs for capacity development strategy in Iraq;
 - Identify the existing CD gaps, weaknesses and needs to advance RE deployment.
 - Present an overview on existing national training centers and local experts.
 - Propose recommendations on possible improvements and strategies aiming to accommodate the identified training needs.
221. The project conducted capacity building activities for the Iraqi officials to support and establish a transparent and attractive process for IPP engagement. A series of exposure visits of the key decision makers in Iraq was organised as part of South-South Cooperation to

⁴¹ Capacity Development Needs Assessment in Iraq. RCREEE & UNDP, 2018.

Morocco, Egypt and Jordan. In addition to that, workshops and events were held locally within the country and abroad targeting technical staff from various ministries, private sector, academic institutes and NGO's. The participants gained knowledge on how to bridge the gaps of the current PPA process.

222. The following are key training session held by the project:

- Training for Baytti staff and staff from Najaf Electricity Department on solar energy installations in Baytti (9 trainee)
- Training for Al Mansour staff on solar energy installation in Al Mansour (5 trainee)
- Training for MoST staff on the solar lab station (5 trainee)
- Training of Iraqi officials to support and establish a transparent and attractive process for the IPP engagement (30 trainee)
- Knowledge exchange visit targeting decision maker in Morocco (9 officials)
- Sensitization of high-level Iraqi decision makers from PMAC during an exposure visits to the RE experience in Egypt (2 officials)
- Awareness and capacity building events targeting local authorities, academia, private sectors and NGOs in Najaf (100 participants)

223. The project carried out a capacity development need assessment for promotion of solar PV in Iraq, wherein, the capacity development needs of different actors has been identified.

224. The progress towards achievement of Targets 15 & 16 is rated as moderately satisfactory and satisfactory respectively.

Progress towards project objective: The progress towards achievement of the project objective is rated as Satisfactory

Objective: To reduce GHG emissions in Iraq by demonstrating and catalyzing the application of distributed solar power to meet the energy needs of offices, small businesses, residences and small town services (small-scale distributed solar PV power plants and utility scale plants, on and off-grid).			
Indicator & baseline	End-of-Project Target	Rating & status at MTR ⁴²	Rating & status at TE
Amount of reduced CO2 emissions by the investments facilitated by the project. Baseline: 0	Target A: Installations in place and operating to achieve direct reduction of 741,622 tonnes CO2 over a 20-year lifetime from project start ⁴³ . (target	Moderately Satisfactory On target to be achieved The MTR suggested to change the target to 160,000 tons of CO2 (from 741,622 tons of CO2) as a subsequent change to	Satisfactory – will be exceeded beyond project timeframes

⁴² Conducted in July 2018.

⁴³ The project document assumes: 1. Iraq Emission Factor is 0.51257, 2. 41.5 MW installed as a direct result of the GEF Project, 3. 20-year lifespan for PV equipment, and 4. a capacity factor of 20%.

	changed to 160,000 tco2) Target B: Indirect: Mechanisms in place to support the further expansion of PV installations to result in indirect emissions reductions of 5.9 million tonnes CO2.	recommendation #1 of the MTR to change the target for installation and operation of utility-scale PV plants to 4 (from 16 in the project document). The MTR also suggested dropping the word "further" from the statement of the indirect target Satisfactory On target to be achieved	Satisfactory
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Project Objectives, Target A & B

225. GHG emission reduction is directly related to the capacity for solar PV. At the time of TE, the project has contributed towards establishment to solar PV capacity of 10.9 MW at the distribution level. The GHG emission reductions due to these solar PV facilities over the lifetime of 20 years would be 195,553.41 tons CO₂, and 10,836.89 tons CO₂ avoided until the time of this TE⁴⁴.

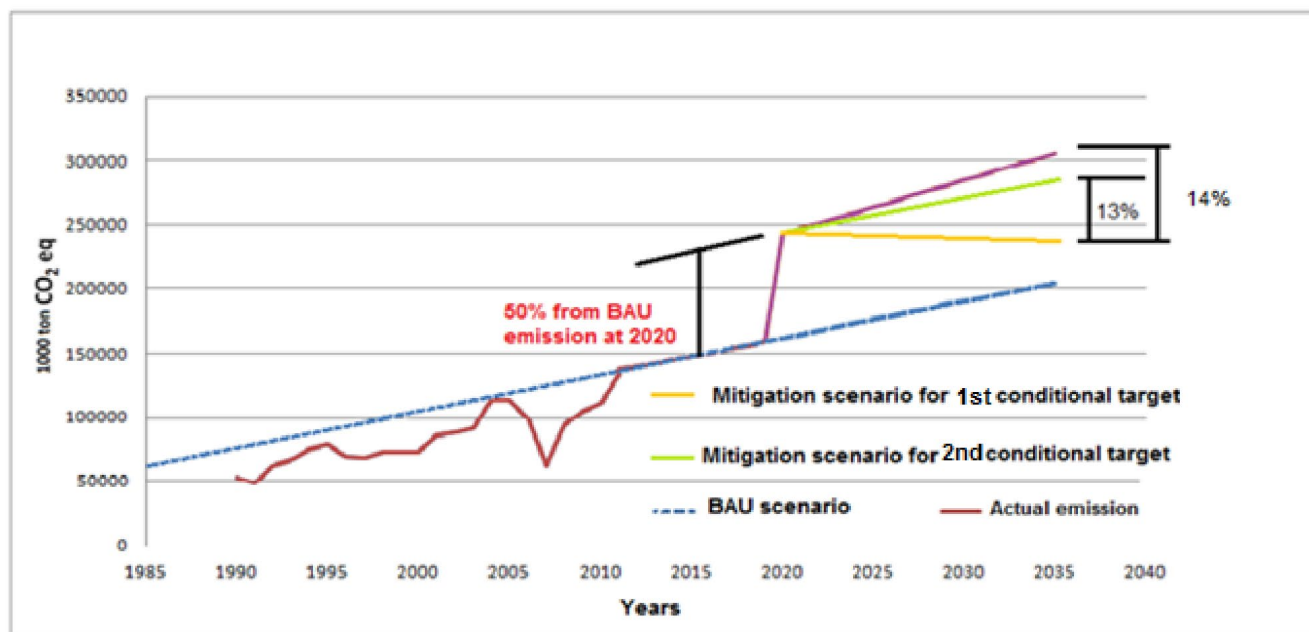
226. Strategically, Iraq submitted its Intended National Determined Contributions (INDC) to the UNFCCC in November 2015. **Iraq has set targets to reduce greenhouse gas (GHG) emissions by 90 million metric tons of CO₂ equivalent, 14% below business-as-usual (BAU) emissions between 2020 and 2035:** 13% are conditional on receiving international support and 1% is unconditional (financed from Iraq's own resources)⁴⁵.

Figure 3: Emission reduction scenarios in Iraq according to the INDCs⁴⁶.

⁴⁴ Based on the same calculation method explained in the project document, and in line with the GEF (2015), GUIDELINES FOR GREENHOUSE GAS EMISSIONS ACCOUNTING AND REPORTING FOR GEF PROJECTS.

⁴⁵ Iraq National Determined Contributions (INDC), 2015.

⁴⁶ Source: Iraq INDCs, available at UNFCCC website



227. The INDC defined RE deployment among the key activities under the 13% conditional reduction target, including PV in buildings and 3.3% increase in hydroelectric power plants installed capacity (dam).
228. According to the Iraq Initial National Communication (INC) report on climate change, the total emission of CO₂eq was 72.658 Gg in 1997 from the following sectors, energy was 54.419 Gg CO₂eq, which is equal 75% from the total emission⁴⁷.
229. Considering the significant contribution of the project to remove the barriers, the project is likely to contribute to the future RE strategic plans of Iraq. According to Iraq National Energy Strategy, **the targeted potential for renewable energy in Iraq is 5% of generation capacity by 2030, generating some 2.9 TWh/year**⁴⁸. Using the calculated average grid emission factor of 0.51kgCO₂/kWh, taking into account then planned dynamic developments in the power generation system, the consequential emissions reductions can be estimated at **19,476,142 tCO₂**, as per the GEF methodology⁴⁹.
230. Applying a conservative GEF Causality Factor of 40%, corresponding to Level 2 ("the GEF contribution is modest, and substation indirect emission reduction can be attributed to the baseline"), **indirect emissions reduction by the project are 5,916,000 tonnes CO₂** in the 10-year period post-project.
231. If a Level 3 Causality Factor ("the GEF contribution is substantial, but modest indirect emission reductions can be attributed to the baseline") is applied, then 60% of the indirect

⁴⁷ Iraq Initial National Communication (INC), 1997.

⁴⁸ Booz & Co. (2012), Integrated National Energy Strategy, p 48

⁴⁹ GEF (2015), GUIDELINES FOR GREENHOUSE GAS EMISSIONS ACCOUNTING AND REPORTING FOR GEF PROJECTS

emissions can be attributed to the GEF project, or 8.9 million tonnes CO₂ in the 10-year period post-project.

232. At the utility scale level, the project made substantial contribution to the pipeline projects (currently going through the bidding process) **755 MW, this would result in additional 13,559,800 tons CO₂ over 20 years starting from 2022** (operation is expected to commence in 2022).

233. The aim of the project is to catalyse growth of solar PV in Iraq. Thus, **the solar PV capacity which is likely to be created over a period of time due to the project (and not that gets created during the duration of project implementation) is more important and better reflect the achievement of the project objective**. It needs to be kept in mind that establishment of a specified capacity of solar PV due to the support provided by the project does not imply that the barriers towards solar PV have been adequately removed. It is the replication of the solar PV after the project which is the true reflection of the impacts of the project in terms of removal of the barriers.

234. The progress towards achievement of Target A & B is rated as Satisfactory.

3.3.2 Relevance(*)

The relevance of the project is rated **"relevant"**.

235. The Project Document was designed with clearly defined objectives, outcomes, outputs, activities and milestones. The overall objective to deliver PV installations at both utility and distribution levels forms the clear basis for the subsequent supporting outcomes, outputs and activities. The intended outputs were designed to be goal-oriented and comfortably achievable within the four-year implementation timeframe.

236. The Project Document is concise and includes the required level of details. It addresses barriers and opportunities for larger uptake of grid connected solar PV in its different components and responds to the national requirements through an appropriate list of outcomes and outputs. The project objective, the 3 outcomes and outputs as mentioned in the Project Document are clear and practical.

237. The project is well aligned with Integrated National Energy Strategy (INES), Iraq Prime Minister Advisory Commission. The INES states clear objective to develop on-grid solar and wind capacity, with a target of developing renewable capacity to exceed 2 GW, approximately 4-5 percent of total system capacity by 2030⁵⁰. The NES for Iraq places particular emphasis on the development of solar power to supply off-grid power requirements in the near-future as an alternative to diesel, and to help supply on-grid demand in the medium- and long-term. This is in contrast with the 2010 EMP, which does not

⁵⁰ 243. The project is well aligned with Integrated National Energy Strategy (INES), Iraq Prime Minister Advisory Commission, 2012.

mention renewable resources at all. The contrast illustrates the shift in thinking, and the developments taking place, within Iraq.

238. The project is also broadly consistent with the Government plans for achieving SDGs and SDG 7 in particular. It is further consistent with Iraq's targets of providing reliable electricity to the population and reducing fossil fuel use in power generation to allow the country to recover more opportunity cost of fossil fuel by exporting it at international market prices.
239. The project is in line with the priorities and strategy of the country for the power sector. Considering that one of the objectives of the project is reduction in the emission of GHGs to address climate change, this project is in line with the stated position of Iraq on the subject of GHG mitigation.
240. The project came at a very critical time in Iraq energy sector development, where moving towards efficiency and RE in a context of oil country such as Iraq was debatable, and the project played a pivotal role in advancing the RE agenda in the country.
241. The project directly addresses objective number 3 of the GEF 5 program strategy "Climate Change Objective 3: Promote investment in renewable energy technologies". The project is aligned with GEF-5 outcomes by expanding beyond the creation of enabling policy and regulatory environment to promote investment in renewable energy technologies, where both private and public capital is scarce and access to modern energy services is low.

3.3.3 Effectiveness & Efficiency (*)

The project effectiveness and efficiency are rated **"satisfactory"**.

242. Rated as satisfactory. This concerns the extent of achievement of objective and outcomes, or likelihood of being achieved: Despite the politically unstable environment, the project achieved its broad objective, outputs and activities as explained in section 3.3.1, any shortcomings in this are largely due to the project's design and extremely challenging political context in Iraq, and in many ways these shortcomings have been overcome by the project's (especially the PMU) efforts.
243. The effectiveness and other criteria for that matter are affected by, among other things, internal and external factors, sometimes beyond the control of the project implementation team and the implementing partner. Clearly, the security aspect is beyond the control of the project team needed to be identified as much as possible and the risks associated with these needed to be assessed throughout the project.
244. The project provided a good model for delivering cost effective outputs, and has procured the skills and expertise of UNDP to contribute to the project delivery, whilst increasing Iraq Government's capacities for future PV investment. Efficiencies were also gained through building on national and regional capability, allowing the project to draw on a wealth of knowledge, skills and expertise available nationally and regionally especially through the active engagement of RCREEE. Having this functionality means the outputs are more likely to be well owned and accepted.

245. The project was due to complete in December 2018; however, the project was granted a no-cost extension to end of December 2019. The extension was reasonable based on the fact that that delivering large-scale projects indeed take time after lengthy policy and regulatory reform process.
246. Overall the project resources (financial, human and time) have been utilised wisely in light the political environment that the project witnessed and helped towards achieving the objectives.

3.3.4 Country ownership

247. As stated already in this report there is ample evidence to support the country, institutional and even individual ownership of the project process, products and outcomes.
248. As stated in section 3.1.4, the Despite being a DIM project, the project management has been engaging relevant stakeholders quite extensively. It has been obvious during the TE, and especially during the interviews, that stakeholders have been engaged constructively and this led to establish a case of ownership, it is noted that many interviewees were calling the project as "our project". Active stakeholders' participation has been critical element in adopting the project outputs and technical advices.

3.3.5 Mainstreaming

249. The project is aligned with and addressed other UNDP key priorities where possible such as gender equality and women's empowerment, improved governance, poverty alleviation, etc. The TE is satisfied that the project; did not disadvantage women, and has actively, where possible, supported the aspirations of women participation in the PV developments in the country. Gender issues were considered wherever practical on the project design and delivery. This included in delivering gender sensitive PV policies and legislations where equal opportunities for PV investment are given to both Iraqi men and women. Similarly, training opportunities and broader engagement strategy considered gender balanced approach.
250. The project is also broadly consistent with the Government plans for achieving SDGs and SDG 7 in particular. It is further consistent with Iraq's targets of providing reliable electricity to the population and reducing fossil fuel use in power generation to allow the country to recover more opportunity cost of fossil fuel by exporting it at international market prices. The TE notes the great contribution that household-level PV investments make towards alleviating the poverty in Iraq by lifting the bills burden.

3.3.6 Sustainability (*)

251. Sustainability is defined as the likelihood of continued services and benefits after the project ends i.e. is there an exit strategy built into the project to ensure continuation beyond the one-off project. Consequently, the assessment of sustainability is expected to consider the risks that are likely to affect the continuation of project outputs and outcomes. The GEF Guidelines establish four areas for considering risks to sustainability and requires the evaluators to evaluate and rate them individually.

Financial

252. The strategy of the project is to create investment in solar PV by providing the policy and legal framework along with incentives to roll out the PV development in the country.
253. There is a plan to allocate 50 billion Iraqi dinar (eq. to \$42 million) in the national annual budget of 2020. However, the budget for 2020 has not passed parliament yet. Of which, the Government of Iraq has recently approved funding of \$20 million for Al-Zawra company to support local manufacturing of the PV panels, this will help to upgrade their production lines.
254. The financial sustainability of the PV development sector in Iraq relies fundamentally on the ability of attracting the private sector. The private sector will bring capital resources needed to develop PV if the investment environment allows. The project has established strong basis that enables the Government to engage with the private sector, for example the PPA and tendering process. Evidently, the private sector engagement framework, that was established by the project, is now being implemented by the Iraqi government, for instance round 2 of utility-scale PV development is progressing to produce 755 MW in the coming few years.
255. The financial sustainability of the project is assessed to be likely.

Socio-economic

256. There was a significant level of awareness in the general public about solar PV technology. However, there is still more awareness needed to build greater confidence in PV at the public level in terms of resources, pay-back period and other facilities it will require etc.
257. Due to the fast growth of solar PV (largely rooftop-based small size) installations in Iraq in the last 5 years, the demand for skilled manpower to operate and maintain such installations has increased. This has been addressed in the project by having a component pertaining to training of individuals and private sector companies.
258. Market subsidies (including tax breaks) continue to play critical roles. These subsidies such as waiving the imported RE equipment from all kinds of taxes and customs, and RE investors are income tax exempt for the first 10 years of operations are significant for PV developments, and it is very likely that these subsidies would be continued, given the Government's long-term goal to reduce its dependency on fossil fuels, and the great interest and demand from the general population.
259. Socio-political sustainability is rated Likely

Institutional Framework and Governance

260. For the first time in Iraq, there is a clear institutional framework defining the roles and responsibilities among Government agencies and private sector institutions in relation to the PV energy. Within the MoE a Renewable Energy and Energy Efficiency Department (REEED) was established during the age of the project.
261. Considering that the Government of Iraq is committed to promotion of renewable sources of energy and that this showcases the commitment of Iraq to addressing the global

problem of climate change, it is expected to continue investment in PV as an important means to reduce its reliance on fossil fuels.

262. Institutional framework and governance sustainability is rated Likely.

Environmental

263. The environmental benefits of solar PV is evident. It is a clean source of energy. There are practically no negative environmental impacts of the project, other than some minor impacts due to change in the land-use pattern. There is a remote possibility of the need to chop down trees and other vegetation in some isolated cases to prevent shading of the solar PV panels.

264. In accordance with the procedure for all the industries in Iraq, the solar PV facilities will need to have an EIA carried out and seek clearance from the Ministry of Environment. There is a minor risk of environment-related issues blocking solar PV projects. From the viewpoint of environmental risk, sustainability of the project is Likely.

3.3.7 Impact

265. The PV market in Iraq has clearly taken off due to the project implementation. The successful impact of the project is evident through:

- GHG Emission Reduction has been achieved and expected to exponentially grow
- The general public is much more conscious now of the need to reduce GHG emission
- Private sector is more capable to invest in PV sector under tendering process.
- Capacity strengthened at national and local levels
- Legal and institutional framework for PV delivery is in place
- Cooperation mechanism established between MoE, private sector and regional sources of knowledge and best practice (i.e RCREEE).

266. The impact of the project is rated significant

4. Conclusions, Recommendations & Lessons

267. The Iraq solar PV project has been successful and has achieved its outcomes and objective. It has produced a number of very good outputs and had a significant and positive impact, which is likely to continue long after the project closes.

4.1 Corrective actions for the design, implementation, monitoring and evaluation of the project

268. The project design was relevant and reasonable to the national development priorities and the Long-Term Energy Strategy of Iraq and continues to be of relevance to the current national development strategy.

269. There were normal budget allocations, however there were overly high expectations of what might be achieved with this project during its timeframe, especially when it comes to

operationalise the utility scale PV developments. This overselling of project's expectations appears to be a necessary component achieve "safe" design to be funded.

270. Adaptive management measures were effectively taken during project implementation to avoid further delays or disruptions in project implementation by providing robust evidence about the ineffectiveness of the Feed in Tariff mechanism, and suggesting reasonable alternatives using the net metering. The adaptive actions on part of the project team to take on board RCREEE as an implementation partner and to establish rooftop solar PV at 6 houses at the Baytti Complex has greatly helped the project.
271. **Recommendation #1:** Design SMARTer indicators for future projects. Although indicators, targets and deadlines were defined in the logframe, several lacked a clear means for tracking progress and impact outside the project with definitive sources of validation in the market, such as external indicators and targets with which to track the real market uptake of PV technologies as discussed in section 3.1.1 of this report. SMARTer indicators need to be designed to capture the full Theory of Change principles so that all indicators and targets are clearly defined at the short term output, medium term outcome and long term impact levels and suitable and realistic means of verification are chosen and detailed. This would help the project to guide its strategic directions, and collect meaningful data that helps to achieve insightful monitoring and evaluation of project activities.

4.2 Actions to follow up or reinforce initial benefits from the project

272. **Recommendation #2:** UNDP to pursue engagement with the MoE for full completion of round 2 of the utility-scale PV tendering process to continue providing advice and best practice.
273. **Recommendation #3:** To maintain the uptake momentum of solar PV installations, it is recommended that Government of Iraq maintains all present fiscal incentives at least for the next 10 years to enable achieving long term targets.
274. **Recommendation #4:** The performance data from solar PV installations at both distributional and utility-scale levels would be of great value for analysing and planning future market development. It is recommended that data on actual PV generation and electricity use be cross-validated with the solar maps to be generated, to guide plans for future solar PV programmes.
275. **Recommendation #5:** Establish a project library and disseminate final knowledge products to all stakeholders. The project has produced enamours technical reports that are properly documented by PMU, but need to be properly disseminated to all stakeholders as a final set of all project outputs. This could be easily done through a CD or a memory stick that include all information in one final source of truth and then distributed to all stakeholders. One of the options which could be explored is creation of a dedicated web-site either hosted by MoST or the University of Baghdad (this will ensure sustainability of this knowledge dissemination platform beyond the implementation of GEF project).

276. **Recommendation #6:** The project identified significant networking opportunities in the MENA region, notably the RCREEE partnership has been effective from the Government of Iraq perspective, it is therefore recommended that Government of Iraq maintain strategic regional partnerships with available sources of best practices and UNDP continue to facilitate south-south cooperation in the RE sector.

4.3 Proposals for future directions underlining main objectives

277. **Recommendation #7:** Having the PV sector taken off in Iraq, it is time to shift thinking towards create an enabled environment for private sector PV investment in Iraq, therefore, it is recommended that UNDP shares with the Government of Iraq (MoE in particular) information about UNDP-invented “Derisking Renewable Energy Investment (DREI) methodology. DREI methodology can help Iraq analyse existing derisking instruments, identify what needs to be improved or added, explore the most effective options and implement the most effective package of public policy actions⁵¹.

4.4 Best and worst practices in addressing issues relating to relevance, performance and success

278. The project demonstrated several best practices which resulted in the successful implementation of the project that may be adopted for the formulation of other projects. Some of the best practices are:

- (a) a very effective stakeholders' engagement in project development and implementation is a contributing factor to successful achievement of the project objectives. Despite being a DIM project, the project management has been engaging relevant stakeholders quite extensively. It has been obvious during the TE, and especially during the interviews, that stakeholders have been engaged constructively and this led to establish a case of ownership, it is noted that many interviewees were calling the project as “our project”. Active stakeholders' participation has been critical element in adopting the project outputs and technical advices. Stakeholder engagement at an aggregate level has been rated as Highly Satisfactory. Another strategic partnership that was identified by the project team is to engage with Prime Ministers Advisory Committee (PMAC). PMAC engagement has been very effective in driving high level adoption of the project products particularly as related to fast tracking the regulatory reform and new law
- (b) Regional networking: the project has successfully identified and established effective regional partnerships with valuable sources of best practices in Jordan, Egypt, Tunisia, Morocco as well as regional organisations like RCREEE. It was obvious during the TE that these partnerships were influential in terms of knowledge transfer and capacity building.
- (C) There was significant trust within the project, between the partners as well as within the management hierarchy, the credit goes to the PMU who effectively built

⁵¹ Derisking Renewable Energy Investment (UNDP, 2013)

this environment. This cannot be prescribed within a Project Document, rather it needs to be grown once the project has started. Trust increases efficiency and significantly reduces transaction costs.

279. **Recommendation #8**: Acknowledging that GEF guidelines suggest conducting terminal evaluations within six months before or after completion of a full-sized project. It is recommended that TE evaluation takes place during the period of 6 months prior end date of the project, where a bigger room for responsive corrective actions are more likely to be implemented.

Annexes

Annex 1: ToR

File attached

Annex 2: List of persons interviewed

Name	Post	organization
1. Mr. Qasim Mohammed Ali	Deputy-DG Ex-member PSC	Ministry of Electricity
2. Mr. Fiah M. Mizher	Deputy-DG Member of PSC	Ministry of Industry and Minerals
3. Mr. Raad Al-hares	Energy Advisor, Prime Ministry Advisory Commission (PMAC)	PMAC
4. Ms. Suzan Sami	Member of PSC Head, Climate change Centre	Ministry of Health Environment
5. Mr. Ali Albeer	Member of PSC Head, Renewable Energy Centre	Ex-Ministry of Science and Technology. Currently under the umbrella of Ministry of higher Education & Scientific Research.
6. Mr. Ammar A. Hadi	CEO, Altraeb Company	Private sector
7. Prof. Dr. Kareem Hasan Alwan	Dean, Urban Planning Institute, Baghdad University. (Ex-Dean, Technical Institute, Middle Technical University)	Ministry of Higher Education and Scientific Research
8. Assis.-Prof. Dr. Ossan Mohamed Ali Al-Juobori	Ex-Head, Department of RE, College of Engineering, Baghdad Univerity	Ministry of Higher Education and Scientific Research
9. Mr. Mohammed Shaker Aldulimi	Secretary General, Iraqi Business Union. Head of Baghdad Centre for Sustainable Energy	Private Sector
10. Mr. Ahmed Hlial	Member of Project Steering Committee (PSC)	Head, RE Department, Ministry of Electricity
11. Mr. Haider Hatoor	Consultant for Baytti Project	Private Sector, Baytti Site, Najaf
12. Tarik-ul-Islam	Former project manager	UNDP
13. Saliou TOURE (Mr.)	Regional Technical Advisor - Climate Change & Sustainable Energy	United Nations Development Programm



14. Rim Boukhchina	Senior Sustainable Energy Expert- Head of "Sustainable Energy Policies and Member States Support" Unit	Regional Center for Renewable Energy and Energy Efficiency (RCREEE)
15. Dr. Maged K. Mahmoud	Technical Director, Senior RE Expert	Regional Center for Renewable Energy and Energy Efficiency (RCREEE)
16. Dr. Abbas Naji Balasem Al-Saidi	Project team	UNDP
17. Eng. Mohammad Alattar	Project team	UNDP

Annex 3: List of documents reviewed

- Project document
- Midterm Review report
- Inception report
- PEB minutes of meeting
- GEF Tracking tools (METTs, scorecards, etc)
- PIR reports
- Various project activities report
- RCREE deliverables
- Quarterly progress reports and work plans of the various implementation task teams
- National strategic plans (INDCs, National Energy Strategy)

Annex 4: Evaluation Question Matrix

Evaluative Criteria Questions	Indicators	Sources	Methodology
Relevance: How does the project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional and national levels?			
How does the project relate to the needs of the beneficiaries, and relevant strategic plan?	- Level of coherence between project objectives and local policies - Degree of coherence between the project and national priorities, policies and strategies in the area of climate change	- Project documents - National policies and strategies to - Key government officials and other partners	- Documents analyses - Interviews with government officials and other partners
How well the program is designed?	Level of coherence between project design and project implementation approach	- Project documents - National policies and strategies to - Key government officials and other partners	- Documents analyses - Interviews with government officials and other partners
Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved?			
To what extent are the expected activities of the project being achieved?	Indicators as defined PROJECT LOGICAL FRAMEWORK	- Project documents including monitoring and evaluation documents - Key stakeholders - Research findings	- Documents analysis - Meetings with main Partners - Interviews with project beneficiaries - Data sourcing from data bases - Data analysis
How is the project effective in achieving its expected outputs/outcomes?	Indicators as defined PROJECT LOGICAL FRAMEWORK	- Project documents including monitoring and evaluation documents - Key stakeholders - Research findings	- Documents analysis - Meetings with main Partners - Interviews with project beneficiaries - Data sourcing from data bases - Data analysis
How effective the project governance, stakeholders engagement, delivery mechanisms and decision	Specific activities conducted to support the development of cooperative	- Project documents and evaluations - Project staff	- Project documents and evaluations - Project staff - PMC representatives

Evaluative Criteria Questions	Indicators	Sources	Methodology
<i>making processes adopted by the program?</i>	- arrangements between partners, • Examples of supported partnerships • Evidence that particular partnerships/linkages will be sustained • Types/quality of partnership cooperation methods utilized	• PMC representatives • Beneficiaries and partners	• Beneficiaries and partners
Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards?			
• <i>How efficiently have the project resources been turned into results?</i>	• Availability and quality of progress and financial reports • Timeliness and adequacy of reporting provided • Level of discrepancy between planned and utilized financial expenditures • Planned vs. actual funds leveraged • Cost in view of results achieved compared to costs of similar projects from other organizations • Adequacy of project choices in view of existing context, infrastructure and cost • Quality of RBM reporting (progress reporting, monitoring and evaluation) • Occurrence of change in project design/ implementation approach (ie restructuring) when needed to improve project efficiency • Existence, quality and use of M&E, feedback and dissemination mechanism to share findings, lessons learned and recommendation on effectiveness of project	• Project documents and evaluations • Project staff • PMC representatives • Beneficiaries and partners	• Document analysis • Key interviews

Evaluative Criteria Questions	Indicators	Sources	Methodology
	design and implementation. • Cost associated with delivery mechanism and management structure compare to alternatives • Gender disaggregated data in project documents		
Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results?			
• <i>What are the probabilities that the project achievements will continue in the long run?</i>	• Evidence/Quality of sustainability strategy • Evidence/Quality of steps taken to address sustainability • Degree to which project activities and results have been taken over by local counterparts or institutions/organizations • Level of financial support to be provided to relevant sectors and activities by in-country actors after project end • Number/quality of champions identified • Elements in place in those different management functions, at appropriate levels (national, regional and local) in terms of adequate structures, strategies, systems, skills, incentives and interrelationships with other key actors	• Project documents and evaluations • Project staff • PMC representatives • Beneficiaries and partners	• Document analysis • Key interviews

Annex 5: Interview guides

Introduction

The Terminal Evaluation is a planned component of all GEF-funded projects. The objective of the Evaluation is to measure the effectiveness and efficiency of project activities in relationship to the overall project objective, and to make recommendations which could improve the project or help plan similar projects. The Terminal Evaluation (TE) of the Project '*Catalyzing the Use of Solar Photovoltaic Energy*' project has been initiated by UNDP Iraq in order to assess the overall project success, assess whether the agreed outcomes have been achieved, and to produce recommendations on any adjustments needed. Findings of the TE will be incorporated as lessons learned and recommendations for design and implementation of future projects.

- Hello, my name is Mohammad Alatoom, I am an international consultant recruited to evaluate the project independently.
- The purpose of the evaluation is to assess the effectiveness and appropriateness of the project
- This is NOT about evaluating the performance of individuals involved in project design and/or delivery
- This interview will inform the evaluation by drawing on your experience and perspectives to reflect on the implementation and success of the project to date.
- The information you provide will be analyzed together with other interviews and used to develop a process evaluation report.
- You will not be identified by name in the report
- This interview is expected to take about 40-60 minutes. Are you happy to proceed?

Interview questions

1. Please give your name, your role in the project and a short description of your responsibilities with reference to the project.
2. In your opinion, what is the most significant accomplishment of the project? Which project actions were most effective in terms of meeting energy and environmental targets? Which are less effective?
3. Were national stakeholders (government, SMEs, building owners, financial institutions, etc.) accepting and actively participating in the project? Were stakeholders well informed of project progress? Did the stakeholders have an adequate role in project decision-making?
4. Have there been clear indications of increased investment in RE and/or environmental as a result of the project? Has public awareness on climate change, renewable energy, energy efficiency and environmental issues

increased as a result of the project? Is private sector now more motivated to participate as a result of the project?

5. Is the project creating long-term, sustainable benefits for Iraq? What project-created measures or actions (legislation, institutions, demonstrations, etc.) provide most significant benefits?
6. Is there adequate coordination between this project and other interventions in the energy/environment sector? Is duplication of effort being avoided?
7. Has the project encountered problems in its implementation? If so, is adaptive management being efficiently applied to meet these challenges?
8. Which lessons and good practice have emerged from the project? Are these relevant for similar projects outside of Iraq?
9. What strategy would you recommend to secure the sustainability of the project results?
10. Do you have any further comments or suggestions?

Annex 6: Evaluation Consultant Code of Conduct Agreement Form

Evaluation Consultant Agreement Form⁵²

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: Mohammad Alatoom

Name of Consultancy Organization (where relevant): N/A

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed on *February. 2020.*

Signature: _____

⁵²www.unevaluation.org/unegcodeofconduct

Annex 7: Signed TE Report Clearance form

(to be completed by CO and UNDP GEF Technical Adviser based in the region and included in the final document)

Evaluation Report Reviewed and Cleared by

UNDP County Office

Name: _____

Signature: _____

Date: _____

UNDP GEF RTA

Name: _____

Signature: _____

Date: _____



Annex 8: Audit Trail

Attached separately

Annex 9: Tracking Tools

Attached separately